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Message from the Editor-in-Chief

Hello from TOJSAT

TOJSAT welcomes you. This journal was initiated in January, 2011 to share knowledge with researchers, innovators, practitioners and administrators of education. We are delighted that more than 200000 researchers, practitioners, administrators, educators, teachers, parents, and students from around the world had visited TOJSAT since January, 2011. It means that TOJET has diffused successfully new developments on science and technology around the world. We hope that the volume nine issue four will also successfully accomplish our global science and technology goal.
I am always honored to be editor in chief of the TOJSAT. Many persons gave their valuable contributions for this issue. I would like to thank to editor and all reviewers.

For any suggestions and comments on the international online journal TOJSAT, please do not hesitate to contact with us.

October 01, 2019

Editors in Chief
Prof. Dr. Aytekin İŞMAN
Sakarya University

Message from the Editor

Dear Readers,

We have reached the final volume of the Online Journal of Science and Technology (Tojsat). Audiences and readers of the journal is widening throughout the World and number of readers of Tojsat have been increasing year by year especially after the conference series of Science and Technology. Tojsat journal is now indexed with Doaj, Dergipark, Cite Factor, Index Copernicus, and Google Scholar and will be cited by Scopus index soon.

The journal favours papers addressed to inter-disciplinary and multi-diciplinary articles shown in the section of scopes. In this issue of journal, selected papers from nanotechnology to Public finacial management, etc. will be published.

I will thank to the readers for their supports by sending their valuable scientific works to publish in this journal.

Prof.Dr. Mustafa S. Dundar

Editor

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A COMPARATIVE STUDY ON EDGE DETECTION METHODS FOR NORTHWEST OF IRAN

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Abstract: The paper presents applying the edge detection methods on NW Iran. Iran is located in the Alpine Himalayan collision zone and is one of the areas where significant tectonic activities occur between the Caucasus and the Zagros Thrust Zone in the north. The area containing important areas of the Alpine-Himalayan orogenesis zone is controlled by a number of active and inactive faults. In order to determine the boundaries of these structures, the magnetic map of the region was constructed and edge detection methods (analytical signal, total horizontal derivative method and tilt angle derivative) were applied to the potential field data. With the interpretation of the magnetic data, the depth of deep sources caused to regional anomalies was found to be approximately 12.71 km whereas the depth of shallow sources was calculated as 1.25 km. In addition to these, when taking into consideration geological background of the NW Iran, the main tectonic elements especially located in the eastern part of the study area are in good agreement with the constructed maps.
Keywords: Analytic signal, tilt, radially average power spectrum

Introduction

Edge detection methods using potential field data play an important role in the interpretation of aeromagnetic data. For this purpose, many methods (analytic signal (AS), tilt derivative, horizontal derivative of tilt (THDR), theta map method, vertical and horizontal derivatives of potential field data, normalized standard deviation method etc.) have been developed by the researches. Nabighian (1972, 1974, 1984) developed the AS method for determining the location of the 2D sources. To define the boundaries of magnetic sources, Cordell and Grauch (1982, 1985) purposed the three steps procedure. The new technique using curve-fitting approach was proved by Blakely and Simpson (1986). Miller and Singh (1994) also generalized the tilt derivative method whereas the total horizontal derivative of the tilt angle for this aim was suggested by Verduzco et al. (2004).

This paper aims to define the boundaries of structures of NW Iran using aeromagnetic data. The investigated areas are situated between the longitude of 44-49° and the latitude of 35-39°. It has important tectonic elements due to collision of the Afro-Arabian continent and Iranian microcontinent (Jahangiri, 2007). Therefore, the determining the boundaries of these structures is great of importance. In this study, the derivatives techniques (i.e., AS, Tilt, THDR) known as edge detection methods have been applied to reduce to pole (RTP) aeromagnetic data that has been built using Geosoft® Oasis Montaj™ software and the results of the study and geological-tectonic structures of the area was correlated with each other.

Geo-tectonic Settings

Iran is located in the Alpine Himalayan collision zone where is an active seismic zone between the Caucasus in the north and the Zagros Overthrust Zone in the south. The tectonic activity of the area mainly related to Tabriz Fault Zone (TFZ) (Fig.1). Many studies have been conducted on the tectonic-geological structure of this region (Stocklin and Nabavi, 1973; Nabavi, 1976; Alavi, 1994; Emami et al., 1993; Saber et al., 2013, Ranjitekantapeh et. al., 2017). These studies have showed that the area has complex tectonic activities associated with both the N–S compressive (E–W thrusts and folds) and E–W extensional (N–S faults) structures (Rebai et al. 1993; Baron et al. 2013; Afshar et al. 2017). The one of the significant region is the Sabalan area located in the northwest part of Mt. Sabalan and it takes place in a very complex compressional tectonic zone, on the NE moving South Caspian sub-plate, near the junction of the Eurasian, Iranian, and Arabian plates (Bromley et al., 2000). Sabalan geothermal field and Sabalan volcano have important role for the region and three main directions of faulting have been recorded: NE, NW and N-S. The area is characterized by late Miocene and Quaternary, trachyandesitic and trachytic to dacitic lavas with massive ignimbrites pyroclastic flows (Shahbazi Shiran 2013; Afshar et al., 2017). The composition of igneous rock complexes is also located in the east of the study area ranges from andesite, trachyandesite to dacite and these rocks are called as cenozoic volcanics.

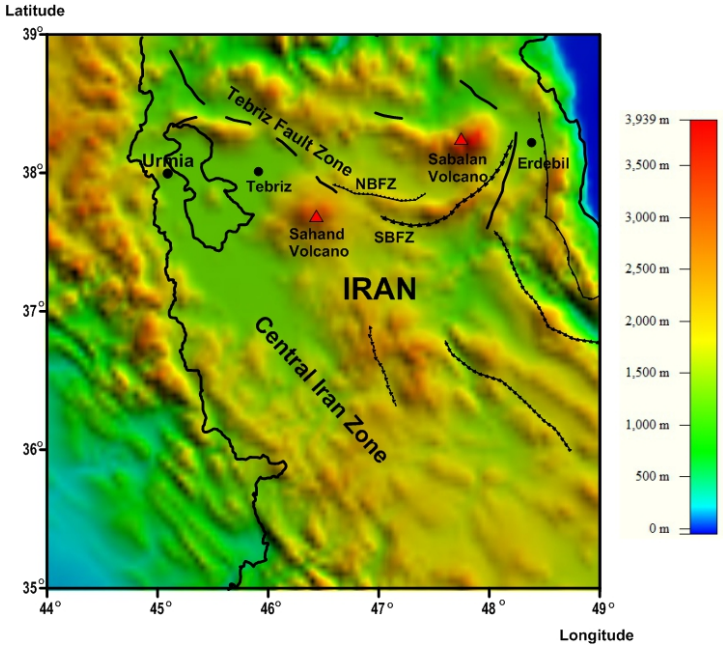

Figure 1. Tectonic map of NW Iran: NBFZ: North Bozkus Fault Zone, SBFZ: South Bozkus Fault Zone

This paper aims to determine the magnetic parameters such as boundaries of important fault structures, volcanos and the depth of the magnetic source in the region. With this purpose, different edge detection methods (analytic signal, tilt angle method, total horizontal derivatives of tilt), which base on the use of potential field derivatives, were applied to the magnetic data obtained from EMAG3.

Methods

The edge - detection methods base on the derivatives of potential field data and they are used to be the filtering process. Prior to applying edge - detection methods, reduce to pole (RTP) correction on magnetic data was performed for eliminating the effects of the earth's magnetic field over source bodies. In this study, edge - detection methods were employed to determine the boundaries of the source bodies for NW of Iran using RTP magnetic data.

1. Analytic Signal

Analytic signal (AS) method enables to define the boundary locations of the causative sources by calculating the horizontal and vertical derivatives of magnetic field anomalies. This method is not much influenced from the ambient magnetic field and source magnetization directions and AS exhibits maxima over magnetization contrasts. Thus, the locations of these maxima specify the outlines of the magnetic sources (Roest et al. 1992; MacLeod et al. 1993). AS formula has been given by Roest et al. (1992) to be:

$$|A(x,y)| = \sqrt{(\frac{\partial f}{\partial x})^2 + (\frac{\partial f}{\partial y})^2 + (\frac{\partial f}{\partial z})^2} \quad (1)$$

where |A (x, y)| is the amplitudes of the analytic signal whereas f is the magnetic anomaly field intensity. ∂_f/∂_x, ∂_f/∂_y and ∂_f/∂_z derivatives of magnetic field, in the x, y and z-direction, respectively.

2. Total horizontal Derivative Method

Total horizontal Derivative Method (TDX) allows to describe sensitively boundaries of structures by using the two orthogonal derivatives of magnetic field. The method is generally utilized as an edge detection filter and it is mathematically expressed as seen in equation 2 (Cordell and Graunch, 1985).

$$\mathbf{TDX} = \sqrt{(\frac{\partial f}{\partial x})^2 + (\frac{\partial f}{\partial y})^2} \quad (2)$$

The f is magnetic field, ∂_f/∂_x and ∂_f/∂_y the two orthogonal derivatives of magnetic field in the *x* and *y*-directions, respectively. It is worth to note that the method gives more effective results on shallower bodies than deeper bodies.

3. Tilt Angle Derivative

The tilt angle is defined (eq. 3) as the arctangent of the ratio of vertical derivative to total horizontal derivative of the magnetic field (f) by Miller and Singh (1994). The method is a useful tool to mapping of shallow basement structure and determining boundaries of the magnetic sources. The tilt angle amplitudes vary between $-\pi/2$ and $+\pi/2$ because of the arctangent trigonometric function. They show positive values over the magnetic body. The negative values of tilt angle amplitudes can be seen near the edge of a vertical source and outside the source region. The zero contours are also the edges of the structures.

$$\text{Tilt} = \arctan\left[\frac{\frac{\partial f}{\partial z}}{\text{TDX}}\right] \quad (3)$$

where TDX is total horizontal derivative of magnetic field and $\partial f/\partial z$ is derivative of magnetic field, in *z*-direction.

4. Total Horizontal Derivatives of Tilt

The total horizontal derivative of Tilt (THDR) is independent of the geomagnetic field and it becomes maximum value over the edge of magnetic sources. The method is defined as;

$$\text{THDR} = \sqrt{\left(\frac{\partial \text{Tilt}}{\partial x}\right)^2 + \left(\frac{\partial \text{Tilt}}{\partial y}\right)^2} \quad (4)$$

by Verduzco et al. (2004). Tilt is the value obtained from tilt angle method. $\partial_{\text{Tilt}}/\partial_x$, $\partial_{\text{Tilt}}/\partial_y$ derivatives of tilt, in the *x*, *y*-direction, respectively. Results of THDR show that the method is more effective for shallow bodies.

5. Radially Averaged Power Spectrum

Radially averaged power spectrum (RAPS) developed by Spector and Grant 1970 is theoretically based on a Fast Fourier Transform (FFT) and it takes advantage of appearance of the spectrum curve to obtain mean depths to interfaces of significant density contrasts in the crust. The mean depth of each source can be expressed as;

$$z = -\frac{m}{4\pi} \quad (5)$$

where z is the depth and m is the slope.

Results and Discussions

The edge detection methods are applied to RTP magnetic data in order to emphasize the boundaries of the geological structures. The maps obtained by utilizing those methods are given in Fig 2. The eastern part of the study area is dominated by positive magnetic values with trending NW-SE which range from 100 nT to 880 nT (Fig 2a-b). This situation can be explained by the presence of the igneous rock complexes in the region. The analytic signal image map shows that the maxima values correspond to boundaries of igneous rock complexes, Sabalan and Sahand Volcanos (Fig.2c). When the tilt angle map (Fig 2d) and THDR map compare with each other, igneous rock complexes are observed prominently in the maps. However, volcanos located in the region are not shown clearly in THDR map (Fig 2e).

The RAPS indicates the averaged depth estimate to top of the magnetic bodies caused the anomalies. The calculated RAPS for the magnetic map is shown in Fig. 2f and it could be divided into three segments. While frequency ranges of the first segment vary from 0.01 to 0.08 cycle/km which represents the long wavelengths is called regional or deep sources component, frequency ranges of the third segment vary from 0.2 to 0.26 cycle/km which characterizes the short wavelengths stem from residual or shallow sources.

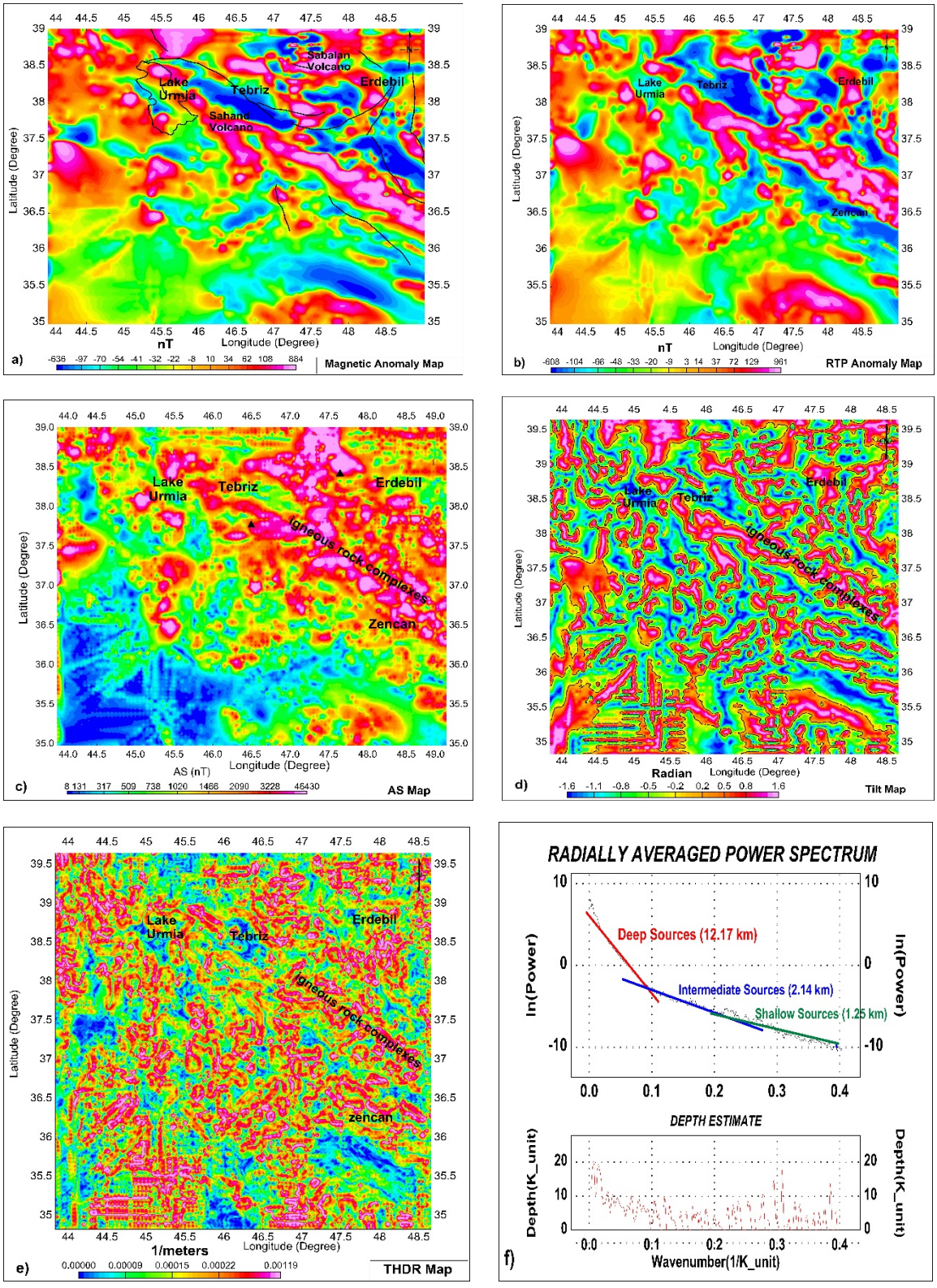

Figure 2. A comparison of edge detection methods: a) Magnetic anomaly map. b) Reduce to pole of magnetic data. c)Analytic signal. d)Tilt angle map of magnetic data (the dashed black lines show the zero contour line). e) Horizontal gradient of tilt of magnetic data. f) Eadially averaged power spectrum.

Conclusions

The edge-detection methods exhibit the boundaries of the structures such as fault, volcano and the correlation between the maps obtained from applying these methods provides substantially convenience for interpretation. According to the maps, AS and tilt angle derivative methods gave better results. While volcanos were monitored in the AS map, igneous rock complexes with trending NW-SE also observed clearly in tilt map. The averaged depth estimations were conducted on in the study by using radially average power spectrum of RTP magnetic data. The spectrum consists of three segment: First segment includes low wavenumber (red segment) and they represent deep sources. The maximum depth of the basement is calculated as 12.17 km. Second segment (blue segment) reflects intermediate depth and find to be 2.14 km. High wavenumber is observed in the third segment (green segment) and this segment correspond to shallow sources (1.25 km). Finally, the study can be concluded that the eastern part of the study area is largely affected igneous rock complexes.

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NANOTECHNOLOGY APPLIED TO RENEWABLE ENERGY

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Abstract: Lately, an important application for Nanotechnology is renewable energy. Scientists and engineers have discovered that by using this technology efficiency, cost, size, and weight are improved directly, and the environment and green energy are improved indirectly.
Benefits such as these make the investment of capital in the research and development of nanotechnology a top priority element, such as in the strategic European plan. An important subfield of nanotechnology related to energy is nanofabrication. Nanofabrication is the process of designing and creating devices on the nanoscale. Creating devices smaller than 100 nanometers opens many doors for the development of new ways to capture, store, and transfer energy. The inherent level of control that nanofabrication could give scientists and engineers would be critical in solving many of the problems the world is facing today with the current generation of energy technologies. Another current problem is the cost of nanofabrication
Keywords: Nanotechnology; renewable energy; photovoltaic; wind power; thermal solar

Nanotechnology and Renewable Energy

Nanotechnology operates at such a fundamental level that there is very little of a technological nature that it will not impact. Thus its effects on energy generation, transmission, storage and consumption are numerous and diverse. Some will be incremental and some quite possibly revolutionary.

Nanotechnology helps increase the efficiency of existing forms of energy while opening up completely new ways of exploiting renewable energies. Given its role as a key and cross-sectional technology, nanotechnology has the potential to achieve decisive technological breakthroughs in the energy sector, thus making important contributions to sustainable energy supplies. The relevant innovations apply across the entire value-added chain. Innovative methods will boost efficiency in all subareas: These include tapping energy sources such as crude oil, natural gas and coal as well as renewable energy sources such as geothermal heat, the sun, wind, water, the tides and biomass. There are also solutions for generating (energy transformation), transmitting and storing electricity all the way to electricity consumption. The number of patents issued for renewable-energy technologies has risen sharply over the last decade, according to new research from MIT and the Santa Fe Institute (SFI). The study shows that investments in research and development, as well as in the growth of markets for these products, have helped to spur this dramatic growth in innovation (Nagy et al. 2013).

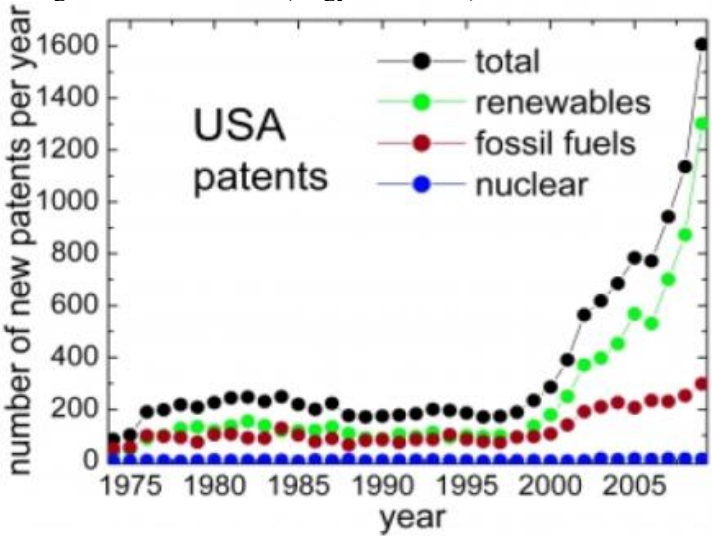

Figure 1. Study found a dramatic increase in the overall number of energy-related patents issued in the U.S., with increase in renewable energy patents far outpacing those in other energy sectors. A similar trend was seen globally.

The inventory is an essential resource for consumers, citizens, policymakers, and others who are interested in learning about how nanotechnology is entering the marketplace. It is meant to be international and expanding.
As of March 10, 2011, the nanotechnology consumer products inventory contained 1317 products or product lines.

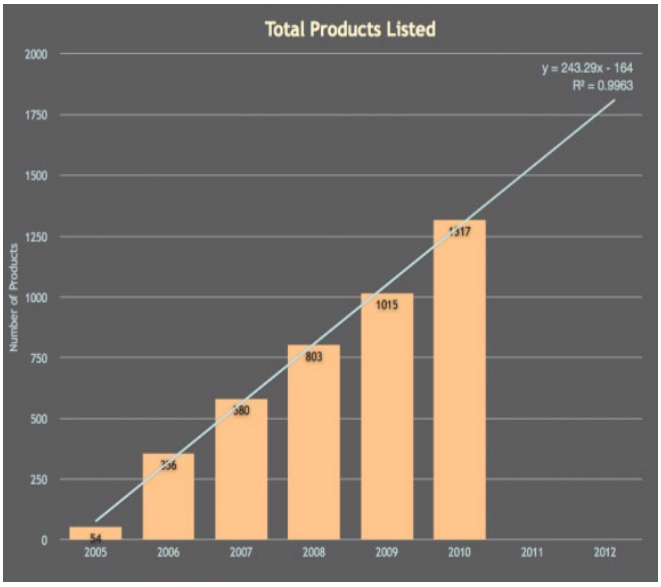

Figure 2. Number of total products listed, by date of inventory update, with regression analysis (Anonymous)

Custom Photovoltaic

The fundamental objectives of nanotechnology applied to solar cells are:

- Increase the light absorption rate.
- Increase the efficiency of the photovoltaic effect.
- Decrease the cost of manufacturing.
- Make PV cells adaptable to different scales and localities.

Nanotechnology is already used to provide improved performance coatings for photovoltaic (PV) and solar thermal panels. Hydrophobic and self-cleaning properties combine to create more efficient solar panels, especially during inclement weather. PV covered with nanotechnology coatings are said to stay cleaner for longer to ensure maximum energy efficiency is maintained.
Using nanoparticles in the manufacture of solar cells has the following benefits:

- Reduced manufacturing costs because of using a low temperature process similar to printing instead of the high temperature vacuum deposition process typically used to produce conventional cells made with crystalline semiconductor material.
- Reduced installation costs achieved by producing flexible rolls instead of rigid crystalline panels. Cells made from semiconductor thin films will also have this characteristic.
- Currently available nanotechnology solar cells are not as efficient as traditional ones, however their lower cost offsets this. In the long term, nanotechnology versions should both be lower cost and, using quantum dots, should be able to reach higher efficiency levels than conventional ones.

Increasing the efficiency of energy production
Nanotechnology could potentially have a great impact on clean energy production. Research is underway to use nanomaterials for purposes including solar cells that are more efficient, practical fuel cells, and environmentally friendly batteries. The most advanced nanotechnology projects related to energy are storage, conversion, manufacturing improvements by reducing materials and process rates, energy saving (by better thermal insulation for example), and enhanced renewable energy sources.

Today's best solar cells have layers of several different semiconductors stacked together to absorb light at different energies but they still only manage to use 40 percent of the Sun's energy. Commercially available solar cells have much lower efficiencies (15-20%). Nanotechnology could help increase the efficiency of light conversion by using nanostructures. Figure 3.

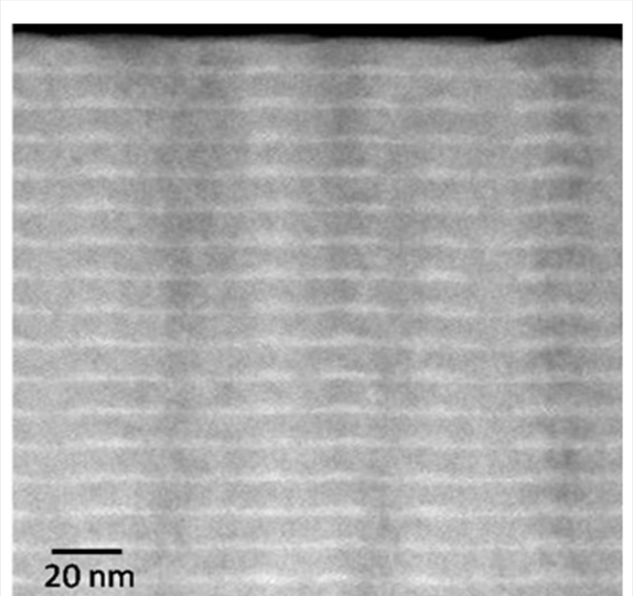

Figure 3. TEM image of self-organized quantum dot superlattice

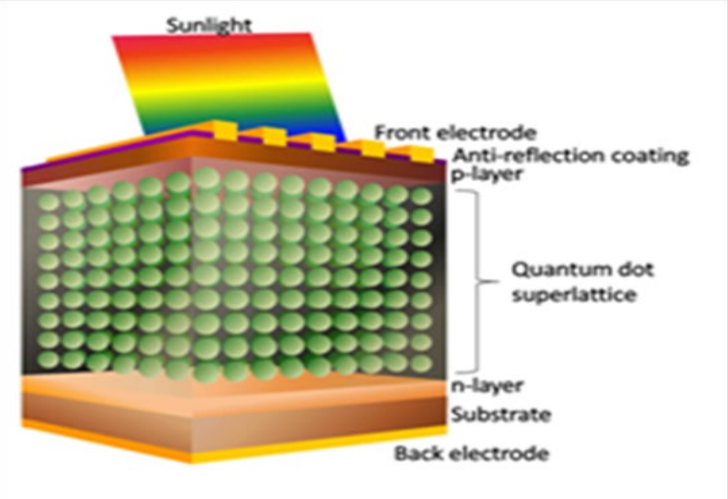

Figure 4. Schematic structure of quantum dot intermediate band solar cell

New semiconductor materials and new quantum nanostructures are produced by crystal growth using molecular beam epitaxy to fabricate high-efficiency next-generation solar cells, such as multi-junction tandem solar cells and intermediate band solar cells, Figure 4 A3-dimensional quantum dot superlattice which consists of multi-stacked layers of self-organized InAs quantum dots is a promising absorber for intermediat band solar cells. This increases the efficiency to 35% compared to 16% of silicon.

Advances in Solar Panel Nanotechnology

Self-Cleaning Solar Panels

In July 2012, ecoSolargy launched a range of solar panels which use self-cleaning glass - this keeps the panels free of dirt and debris, to ensure that the PV cells receive as much of the incident solar energy as possible. This technique is very effective in helping the conventional cells to perform at peak efficiency.
We will probably see much more of this sort of indirect application of nanotechnology to solar panels in the coming years, before nanotechnology is able to gain a significant market share in the actual PV materials used.

Dye-Enhanced Solar Cells - Mimicking Photosynthesis
In May 2012, Northwestern University researchers developed a new sort of "dye-sensitized" solar cell (part of the second generation of photovoltaic technologies), which uses an organic dye monolayer to help absorb sunlight, much as plants do for photosynthesis.

Dye-sensitized PV cells have been explored before - however, the organic dye used is usually a liquid, which can leak out, drastically shortening the lifetime of the cell. The advance made by the team at Northeastern University is to use a dye which is just as effective at capturing solar energy, but solidifies, preventing it from leaking and giving the cell a viable lifetime.

Their novel solar cell also uses a number of other nanomaterials, like titanium dioxide nanoparticles and cesium tin iodide thin films, as high-performance p-type and n-type semiconductors.

Connection between Stacked Solar Cells (Samberg 2013)
North Carolina State University researchers have come up with a new technique for improving the connections between stacked solar cells, which should improve the overall efficiency of solar energy devices and reduce the cost of solar energy production.

Stacked solar cells consist of several solar cells that are stacked on top of one another. Stacked cells are currently the most efficient cells on the market, converting up to 45 percent of the solar energy they absorb into electricity

However, to be effective, solar cell designers need to ensure the connecting junctions between these stacked cells do not absorb any of the solar energy and do not siphon off the voltage the cells produce -- effectively wasting that energy as heat.

Nanowire Solar Cells Raise Efficiency Limit (Krogstrup 2013)
Scientists from the Nano-Science Center at the Niels Bohr Institut, Denmark and the Ecole Polytechnique Fédérale de Lausanne, Switzerland, have shown that a single nanowire can concentrate the sunlight up to 15 times of the normal sun light intensity. The results are surprising and the potential for developing a new type of highly efficient solar cells is great.

Due to some unique physical light absorption properties of nanowires, the limit of how much energy we can utilize from the sun's rays is higher than previous believed. These results demonstrate the great potential of development of nanowire-based solar cells. During recent years, research groups have studied how to develop and improve the quality of nanowire crystals, which are a cylindrical structure 10,000 times smaller than a human hair. The nanowires are predicted to have great potential in the development not only of solar cells, but also of future quantum computers and other electronic products.

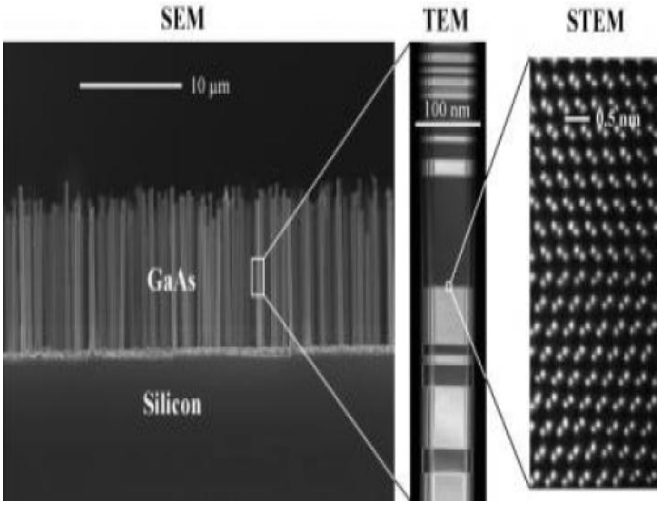

Figure 5. Schematic structure of the nanowires naturally concentrate the sun's rays into a very small area

It turns out that the nanowires naturally concentrate the sun's rays into a very small area. Because the diameter of a nanowire crystal is smaller than the wavelength of the light coming from the sun it can cause resonances in the intensity of light in and around nanowires Figure 5. Thus, the resonances can create concentrated sunlight, where the energy is converted, which can be used to give a higher conversion efficiency of the sun's energy.

Quantum dots or nanowires
Putting the amorphous quantum dots in an array or merging them into a nanowire are the best assemblies for maximizing the efficiency of silicon nanomaterials to absorb light and transport charge throughout a photovoltaic system according to a study from researchers at North Dakota State University and the University of South Dakota (Kryjevski 2013).

Amorphous Silicon nanowire facilitates harvesting of solar energy in the form of a photon. In the process of light absorption a pair of mobile charge carriers is created. The energy of their directed motion is then transformed into electricity. Electron and hole charge distributions are often located in different regions of space due to multiplestructural defects in amorphous silicon nanowires.

The crown jewel of nanotechnology (Gluba 2013)
Graphene has extreme conductivity and is completely transparent while being inexpensive and nontoxic. This makes it a perfect candidate material for transparent contact layers for use in solar cells to conduct electricity without reducing the amount of incoming light -- at least in theory. Whether or not this holds true in a real world setting is questionable as there is no such thing as "ideal" graphene -- a free floating, flat honeycomb structure consisting of a single layer of carbon atoms: interactions with adjacent layers can change graphene's properties dramatically. Now the HZB Institute for Silicon Photovoltaics has shown that graphene retains its impressive set of properties when it is coated with a thin silicon film. These findings have paved the way for entirely new possibilities to use in thin-film photovoltaics.

Graphene was deposited onto a glass substrate. The ultrathin layer is but one atomic layer thick (0.3 Angström, or 0.03 nanometers), although charge carriers are able to move about freely within this layer. This property is retained even if the graphene layer is covered with amorphous or polycrystalline silicon.

Their measurements of carrier mobility using the Hall-effect showed that the mobility of charge carriers within the embedded graphene layer is roughly 30 times greater than that of conventional zinc oxide based contact layers. (Wang 2013). Also graphene can be applied as a substitute for platinum when Dye-sensitized solar cells are thin, flexible, easy to make and very good at turning sunshine into electricity. However, a key ingredient is one of the most expensive metals on the planet: platinum. While only small amounts are needed, at $1,500 an ounce, the cost of the silvery metal is still significant.

All-Carbon Solar Cell
The solar cell consists of a photoactive layer, which absorbs sunlight, sandwiched between two electrodes. In a typical thin film solar cell, the electrodes are made of conductive metals and indium tin oxide (ITO). And this is replaced with conventional electrodes with graphene -- sheets of carbon that are one atom thick -and single-walled carbon nanotubes that are 10,000 times narrower than a human hair.

The active layer made of carbon nanotubes and "buckyballs" -- soccer ball-shaped carbon molecules just one nanometer in diameter. Currently the efficiency is less than 1%.

Solar Thermal

We can apply almost the same nanotechnology from the second chapter to this kind of generation energy.
As is well known, for example one of the most important problems is that this type of energy is the heliostats need to clean almost every day because they get dirty. Therefore, it´s important to have a self-cleaning system. This isn´t an easy thing to do, because you need specific machines, water and other chemical products.

To resolve this problem we can use the lotus-leaf effect using nanotechnology to reproduce what nature does. Self- cleaning surfaces are based on the superhydrophobic effect, which causes water droplets to roll off with ease, carrying away dirt and debris. Figure 6.

Figure 6. Schematic structure of the nanowires naturally concentrate the sun's rays into a very small area

Every material has an energy associated with its surface, and when a fluid droplet is in contact with this surface, the energies of the three-phase contact line balance to a minimum, forming a distinct angle of contact with the other surface. A specific research project for this type of energy is the Thermalcond project, which is a European collaborative project aimed at developing a novel collector containing plastic components with high efficiency, low cost and less weight structures compared to metallic collectors. These collectors will have an improved design due to the use of plastic materials, high thermal conductive nanoparticles modified with SAM technology, and a flexible absorber coating based on nanometallic oxides (Figure 7).

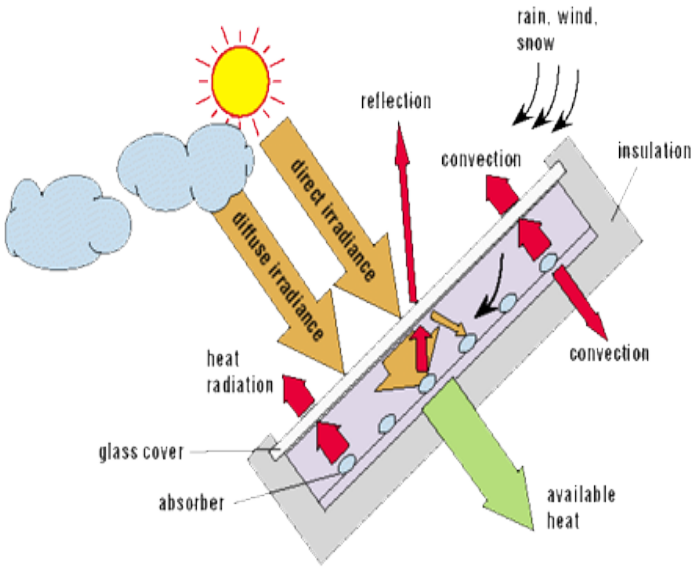

Figure7. Collectors will have an improved design due to the use of plastic materials, high thermal conductive nanoparticles

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Wind Power

Various nanotechnologies are utilized to improve the efficiency of power-generating wind turbines, including nanoparticle-containing lubricants that reduce the friction generated from the rotation of the turbines, nanocoatings for de-icing and self-cleaning technologies, and advanced nanocomposites that provide lighter and stronger wind blades. For example the
Following

-De-icing coatings

Surface treatment to repel water could prevent ice forming on the blades

- Lotus Plant non-wettable self-cleaning leaves due to nanostuctured rough surface with wax crystals.
- Reduced porosity and moisture absorbance.
- Self-cleaning coatings like Pilkington's self-cleaning glass

-Weight saving

- Strength/ weight improvements
- Tensile strength up 40%
- Tensile modulus (elasticity) up 68%
- Flexural strength up 60 %
- Flexural modulus (bending) up 126%
- Distortion temperature up from 65% to 152%
- Improved flame retardant properties
- 20% weight saving over conventional materials

-Lubricants

- Nanolubricant for improved wear resistance at all temperatures and pressures

-New Sealants

- Novel sealants based on nanocomposite elastomers

-Hydraulic systems

- Brake systems, pitch & yaw controls
- On-board cranes, locking systems.
- Pumps, drives, oil tanks, filters, pressure valves and control systems

-Power pack improvements

- Carbon nanotubes as fuel storage
- Control systems are increasingly important
- SCADA for systems required by grid operators

-Condition monitor

- Remote control and full monitoring
- Mini generators and energy storage for start-up and nil wind.

Conclusions

- Clean power generation from renewable energy is seen as the solution to the climate impacts of the energy sector. However, there are barriers yet to be overcome to scale up energy production through renewables.
- In the United States, only 9 percent of total energy consumed came from renewable sources in 2011 according to the Institute for Energy Research. In Germany, renewables only account for 12 percent.
- The main challenges now for the application of nanomaterials in the energy sector are the improvement of efficiency, reliability, safety and lifetime, as well as the reduction of costs.
- To date, universities, research institutes and even governments are paying attention to the synergy that could be established between nanotechnology and renewable energy.
- Thanks to better nanomaterials, PV solar cells are increasing their efficiency while reducing their manufacturing and electricity production costs at an unprecedented rate. Hydrogen production, storage and transformation into electricity in fuel cells are being benefited from more efficient catalysts for water splitting, better nanostructured materials for higher hydrogen adsorption capacity and cheaper, simpler fuel cells.

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PYTHON PROGRAMMING LANGUAGE

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Abstract: Rapid technological developments in the world of information have led to a rapid change of hardware and software. Hardware and software, which are inseparable pairs, have not changed at a parallel speed. In the hardware world, a faster development has been observed. But in the software world, they have not developed at the same speed.

Without a software, we know that a piece of hardware cannot sum two numbers. Therefore, the programming language, which is the main factor in the production of software, has a great importance. The most widely used programming languages are C, C ++, Java, C# programming languages.

There are a number of enhancements as well as a lack of script-based programming languages. The obvious features of coding are easy to understand and easy to learn. For the first time, students who will start learning programming languages have great benefits when starting with a language that is easy to learn. Especially Python and Ruby programming languages are simple to learn. However, these languages have quite advanced features.

The aim of this study is to make sure that the reasons that will enable university students to turn to scripting languages in their programming language teaching curriculum. It is to explain the basic features of the Python programming language and to explain that it is easy to learn. Python programming language to explain what can be done with examples.

Keywords: Programming Language, Script Programming Languages, Python Programming Language, Ruby Programming Language

Introduction

Python is a programming language written by a Dutch programmer named Guido Van Rossum. Python started its development in 1990. While many people think that the name Python comes from the python snake, this is not the case. Python developer Guido van Rossum inspired his programming language with the name of Monty Python's Flying Circus, a British comedy group called The Monty Python. Although it is the case, the Python programming language has become a tradition.

Unlike Python language C - C ++, Interpreter is an interpretive language. Therefore, you can run without compiling and thus you can develop applications very quickly. If you know any programming language, the speed of learning Python will be very high. Using Python's simple syntax, it is much easier to write programs in Python or to read a program written by someone else than in other languages. Python can be run on many systems thanks to cross platform support. Many Linux distributions include Python 2.x or higher. Popular Linux distributions also use Python to develop various applications. (For example, Ubuntu Software Center) Python, Google, Youtube, Yahoo! used by companies to develop software. Google also provides business opportunities for people with advanced Python knowledge. Python developer Guido Van Rossum worked on Google from 2005 to 2012. Using Python, desktop programming, game programming, portable device programming, web programming and network programming can be developed. Python optimizes your application's memory usage thanks to its Garbage Collector. It is capable of working with Python, Java and .NET platforms. Python is a free language.

1. Python Installation

The most up-to-date and current source code, binaries, documentation, news, etc., is available on the official website of Python https://www.python.org/

It can be download Python documentation from https://www.python.org/doc/. The documentation pages are available in popular document format. Python deployment is available for a wide variety of platforms. You can only download and install the distribution on your computer.

Windows Installation;

- Open https://www.python.org/downloads/ address in a web browser
- Click download windows installer link.
- Run MSI file (Your system must support Microsoft Installer). Install Wizard starts. Accept default settings.

You can check Python installation on Windows. Open command prompt and type it python –version
Running Python;

In Linux/Unix

$ python

In Windows

C:\> python

```
C:\>python
Python 3.6.5 (v3.6.5:f59c0932b4, Mar 28 2018, 16:07:46) [MSC v.1900 32 bit (Intel)] on win32
Type "help", "copyright", "credits" or "license" for more information.
>>>
```

Python is an interpreted programming language, this means that as a developer you write Python (.py) files in a text editor and then put those files into the python interpreter to be executed.

The way to run a python file is like this on the command line:

C:\> python helloapp.py

“helloapp.py” is the name of Python file.

2. Python Programming Rules

As with any programming language, there are some basic rules of the Python programming language.

Syntax;

Where in other programming languages the indentation in code is for readability only, in Python the indentation is very important. Python uses indentation to indicate code block.

Example;

```
if(10 > 5):
    print("Ten is greater than five")
```

If you type an error occurs;

```
if(10 > 5):
print("Ten is greater than five")

print("Ten is greater than five");
   ^
IndentationError: expected an indented block
```

Comments;

```
# Comments
```



```
print("Hello Students")
```

You can use multi line comments with “””

```
"""
Comments Line 1
Comments Line 2
Comments Line 3
"""
```

3. String Type Using

String literals in python are surrounded by ' ', or "" .

'Ali ' is same with this "Ali"
print("Ali")
Strings in Python are arrays of bytes representing unicode characters.

```
name = "Mustafa"
print(name) # 'Mustafa’
print(name[1]) # 'u'
```

name[1] is second character of name variable.

```
print(name[2:6]) # 'staf' from 2.position to 6.position
```

stript() method removes beginning or the end spaces

```
message = " Hello students  "
print(message.strip()) # 'Hello students'
```

len() method returns the length of string

```
message = "Hello students"
print(len(message)) # lengths is 14
```

lower() method returns the lower of string

```
message = "Hello students"
print(message.lower()) # hello students
```

upper() method returns the lower of string

```
message = "Hello students"
print(message.upper()) # HELLO STUDENTS
```

replace() method replaces a string with new string

```
message = "Hello students"
print(message.replace("H","M")) # Mello students
```

split() method splits into substrings by a separator

```
message = "Hello, students"
print(message.split(",")) # ['Hello', ' students']
```

You can input any string from command line

```
print("Enter your department")
```



```
department = input()
print("You are working in " + department)
```

Result:
Enter your department
Computer Technology
You are working in Computer Technology

4. Operators

We make various operations when working with variables. Arithmetic or logical operations. Operator symbol is a decision of this operation. In a Go program you will find operators are listed;

- Arithmetic
- Assignment
- Comparison
- Logical
- Identity
- Membership
- Bitwise

4.1. Arithmetic Operators

Python arithmetic operators are listed below

Operator Name	***Description***	***Using***
+	Addition	d + e
-	Subtraction	d - e
*	Multiplication	d * e
/	Division	d / e
%	Modulus	d % e
**	Exponentiation	d ** e
//	Floor division	d // e

```
d = 100
e = 10
f = d + e
print("Sum :" + str(f) )
f = d - e
print("Subtract :" + str(f) )
f = d * e
print("Multiply :" + str(f) )
f = d / e
print("Divide :" + str(f) )
f = d % e
print("Modulus :" + str(f) )
f = d ** e
print("Exponantiation :" + str(f) )
f = d // e
print("Floor Division :" + str(f) )
```

Result:
Sum :110
Subtract :90

Multiply :1000
Divide :10.0
Modulus :0
Exponantiation :100000000000000000000
Floor Division :10

Conclusions

Developing a program is not as difficult as it is thought. Anyone with an analysis ability and who is in the world of computing can develop an application. Developing a software and running it is a really good feeling. Starting with high-level programming languages is much more reasonable. Using a good development environment (IDE), an application can be said to be a simple operation. In today's world the need for programmers is increasing day by day. Programming has become a profession with high income and can be used in all areas. Consideration should be given to the advanced features of the Python programming language, such as the easy structure and fast operation. Python is a language that can be used in various fields and is easy to learn. It is a language with a library according to the desired needs. Programming can be started with Python. Especially high school and higher level students must meet Python. According to research, students have shown more interest in simple programming languages. Python stands out with ease here.

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THE RESEARCH OF SOCIO-ECONOMIC DEVELOPMENT IN THE EUROPEAN UNION COUNTRIES WITH AN APPLICATION OF THE MODIFIED HDI INDICATOR

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Abstract: The aim of this paper will be the presentation of an alternative, a deeper one compared to the popular measure of the standard of living, which is HDI, a measure of the socio-economic development of residents of the European Union. In this article the synthetic index of the socio-economic development of the European Union countries will be presented. It will be calculated through the use of the following determinants: 'Economy and Finance', 'Science and Technology', 'Health', 'Education' and 'Living Condition'. This index of the socio-economic development of residents of the European Union countries will be created as an arithmetic mean of indicators counted for particular determinants. The index, which will be created, is treated as a modified Human Development Index due to the fact that it will be completed with the added information.
Keywords: Socio-economic development, the European Union countries, HDI index, synthetic index, development index

Introduction

When we inquire about the prosperity of a nation or a region of the world and about the quality of life of its inhabitants the problem still arises: How do we determine this? What information do we require? Which criteria are truly relevant to human 'thriving'? Most social scientists and economists would agree that GNP per capita is a crude and incomplete measure of quality of life. (Nussbaum, Sen 1993, Szirmai 2015). What in this case is important about human quality of life? The problem is actually more complex. It is not only the money people do or do not have, it is about how they are able to conduct their lives and what factors influence it.

The Human Development Index (HDI) was created by M. ul Haq in 1990 with the help and advice of A. K. Sen, who established the first assumptions of comprehensive measurement of socio-economic development (Anand, Sen 1994). The index operationalized the broad concept of human development by combining health, education and income into a composite index (Aguña, Kovacevic 2010). The indicator itself was systematically improved. The most significant change was made in 2010 and was a reflection of several assumptions made by M. ul Haq, inter alia: possibility of measuring the basic concept of human development to expand humans' choices; including only a limited number of variables (to keep it simply and manageable); to be constructed rather than using plethora of separate indices; covering both social and economic choices; with the use of quite flexible methodology and resistance to missing data (ul Haq 2003). HDI is a synthetic measure based on the average of indicators covering three basic spheres of life:

1. The sphere of health, which is assessed by the ratio of the average life expectancy.
2. The sphere of education, which is assessed on the basis of the rate of educational attainment, as measured by two indicators of educational designated for the adult population, ie.: literacy (the share of people who could read and write with understanding) and schooling (the average time of education, understood as the average number years of schooling).
3. The sphere of income, which is assessed on the basis of GNP (US $) per capita, calculated according to purchasing power parity (PPP $).

On this basis, the geometric mean of the indictors is calculated and, in result, the HDI ranks countries on a scale from 0 (the lowest level of human development) to 1 (the highest level).

The necessity of finding a new measurement of the quality of life of societies is emphasized by international organizations and especially scientists. That is why the author decided to modify the standard measure. Nowadays important factors are also science and technology and the standard of human living.
That is why, in this paper the following determinants of socio-economic development will be used:

1. Economy and Finance
2. Science and Technology
3. Health
4. Education
5. Living Conditions

Materials and Methods

The construction of the synthetic measure of development requires the division of diagnostic variables set to stimulants and destimulants. Variables included in the set of stimulants have been marked with the sign (+), while the (-) granted destimulants. The transformation of destimulants to stimulants was made according to the following formula:

$$x_{ij}^{\{S\}} = \max_i x_{ij}^{\{D\}} - x_{ij}^{\{D\}} \quad (1)$$

where:
x_{ij} – value of the j-th variable for the i-th country,
S symbol indicates stimulant, while the symbol D destimulant.

Then, after the transformation of destimulants to stimulants, the normalization of variables was used according to the following formula:

$$u_{ij} = \frac{x_{ij}}{\max_i \{x_{ij}\}} (i = 1,...,n; j = 1,...,m) \quad (2)$$

where:
u_{ij} – normalized value of the j-th variable for the i-th country,
n – number of countries,
m – number of variables.

Synthetic measure of the socio-economic development was calculated by the following formula:

$$u_i = \frac{1}{r}\sum_{q=1}^{r} u_{iq}, \ (i = 1,...,n; \ q = 1,...,r) \quad (3)$$

where:
u_{iq} – synthetic variable value for the i-th country calculated on the basis of the variables belonging to the q-th determinant,
r – number of determinants.

In contrast, measures of socio-economic development according to separate determinants was calculated using the following formula (Zeliaś 2004):

$$u_{iq} = \frac{1}{m}\sum_{j=1}^{m} u_{ij}, \ (i = 1,...,n; j = 1,....,m) \quad (4)$$

A detailed list of indicators used for the construction of indicators for individual determinants of socio-economic development has been given below. Indicators have been selected based on the availability of Eurostat data.

I. Economy and Finance

1. Unemployment rate (-)
2. GDP per capita 1 (+)
3. Indicator of real expenditure per 1 inhabitant (+)
4. The number of poor people per 1000 inhabitants (-)

II. Science and Technology

1. Gross domestic expenditure on R&D (% of total expenses) (+)
2. Human resources in science and technology (% of the active population) (+)
3. The number of patent applications submitted to the European Patent Office per million inhabitants (+)
4. The number of researchers per 1000 inhabitants (+)

III. Health

1. Self-perceived long-standing limitations in usual activities due to health problem (-)
2. Self-reported unmet needs for medical care due to being too expensive (-)
3. Healthy life years (+)
4. Number of doctors per 1000 inhabitants (+)
5. Number of beds in hospitals per 100 000 inhabitants (+)

IV. Education

1. Participation rate in education and training (persons aged 25 to 64 years old) (+)
2. The percentage of people with at most lower secondary education and with no further education at the age of 18-24 years old (-)
3. The percentage of people obtaining a higher education between the age of 20 and 24 years old (+)
4. The percentage of people gaining or with higher education aged 15 to 64 (+)
5. The percentage of people with secondary education between the age of 15 to 64 (+)

V. Living Conditions

1. The percentage of people who are unable to meet unexpected financial expenses (-)
2. The percentage of people who are not able/unable to make 'ends meet' (-)
3. The rate of people at risk of poverty (-)
4. Share of people living in under-occupied dwellings (+)

Results and Discussion

The proposed construction of a synthetic measure of socio-economic development is based on five pillars. On the basis of the values of synthetic measures for each determinant of socio-economic development, the final synthetic measure was calculated (table 1 and figure 2). According to the low correlation between variables, the synthetic index was calculated on the basis of all of the analyzed indicators. On the 1. graph the values of HDI index for EU countries are presented. The distribution of HDI values in the EU countries is not very diverse (figure 1), if it is assumed that - hypothetically, this indicator may have values from 0 to 1. In addition, it is a substantive conclusion - HDI is characterized by very low sensitivity for changes in conditions life. Partial indicators included in the HDI: GDP, life expectancy and indicators related to the level of education show high stability over time. Therefore, HDI values, for example, the financial crisis of 2008, which afflicted a country such as Greece, Spain or Ireland, hardly shows, while living standards in the dynamically developing countries of the "new" Union are relatively low (Poland, the Czech Republic, Hungary, etc.).

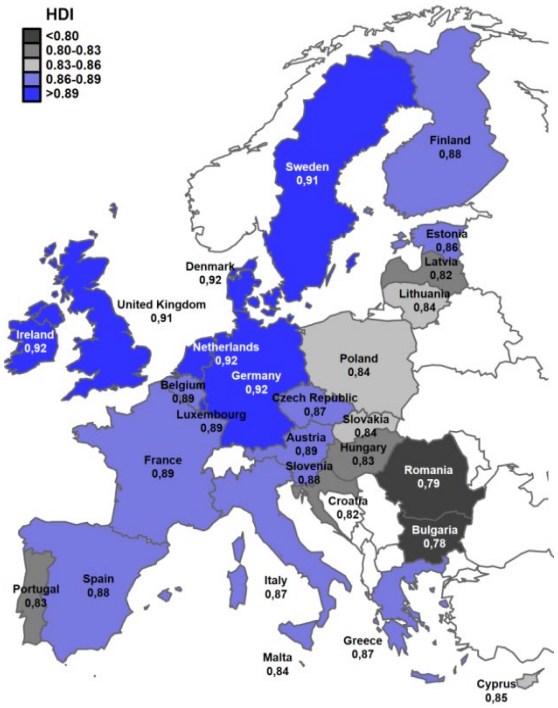

Figure 1. Values for HDI measure
(Source: author's calculations)

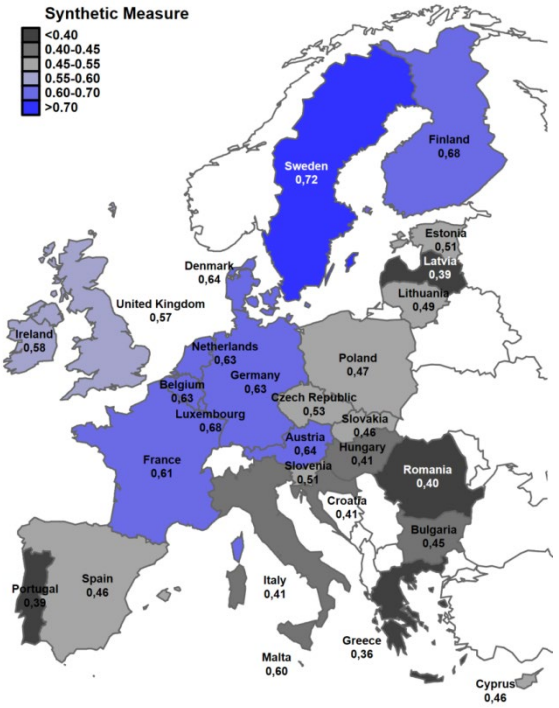

Figure 2. Values for 'Synthetic measure'
(Source: author's calculations)

Ranking of the EU countries according to the modified synthetic indicator of the socio-economic development was presented in the table 1. It can be seen that the highest values obtained Scandinavian countries – Sweden, Finland and then Luxembourg. The lowest values Portugal, Latvia and Greece, where the highest impact of financial crisis was observed.

Table 1. Positioning the EU countries according to the modified synthetic indicator of the socio-economic development

	Economy and Finance	Science and Technology	Health	Education	Living conditions	Synthetic measure
Sweden	4	2	17	1	1	**1**
Finland	6	1	16	3	3	**2**
Luxembourg	1	9	4	6	14	**3**
Denmark	3	3	6	2	17	**4**
Austria	5	7	5	9	6	**5**
Belgium	12	5	23	18	5	**6**
Germany	9	4	9	16	9	**7**
Netherlands	7	6	15	8	4	**8**
France	14	8	19	5	7	**9**
Irland	13	11	13	14	8	**10**
Malta	2	24	20	28	2	**11**
Great Britain	11	10	2	4	12	**12**
Czech Republic	16	13	24	11	13	**13**
Slovenia	15	12	3	10	21	**14**
Estonia	10	14	14	7	15	**15**
Lithuania	18	16	10	12	18	**16**
Poland	21	21	11	17	16	**17**
Spain	27	15	7	23	10	**18**
Slovakia	24	23	1	19	11	**19**
Hungary	19	18	12	21	28	**20**
Cyprus	8	25	18	13	25	**21**
Bulgaria	25	26	26	22	20	**22**
Croatia	26	27	22	20	19	**23**
Italy	22	20	27	25	23	**24**
Romania	20	28	8	26	22	**25**
Portugal	23	17	21	27	26	**26**
Latvia	17	19	28	15	27	**27**
Greece	28	22	25	24	24	**28**

(Source: author's calculations)

Figures 3-7 present regression models for individual determinants of socio-economic development. Models of regression functions allowed to obtain estimated parameters for synthetic measure in terms of each of the determinants of socio-economic development.

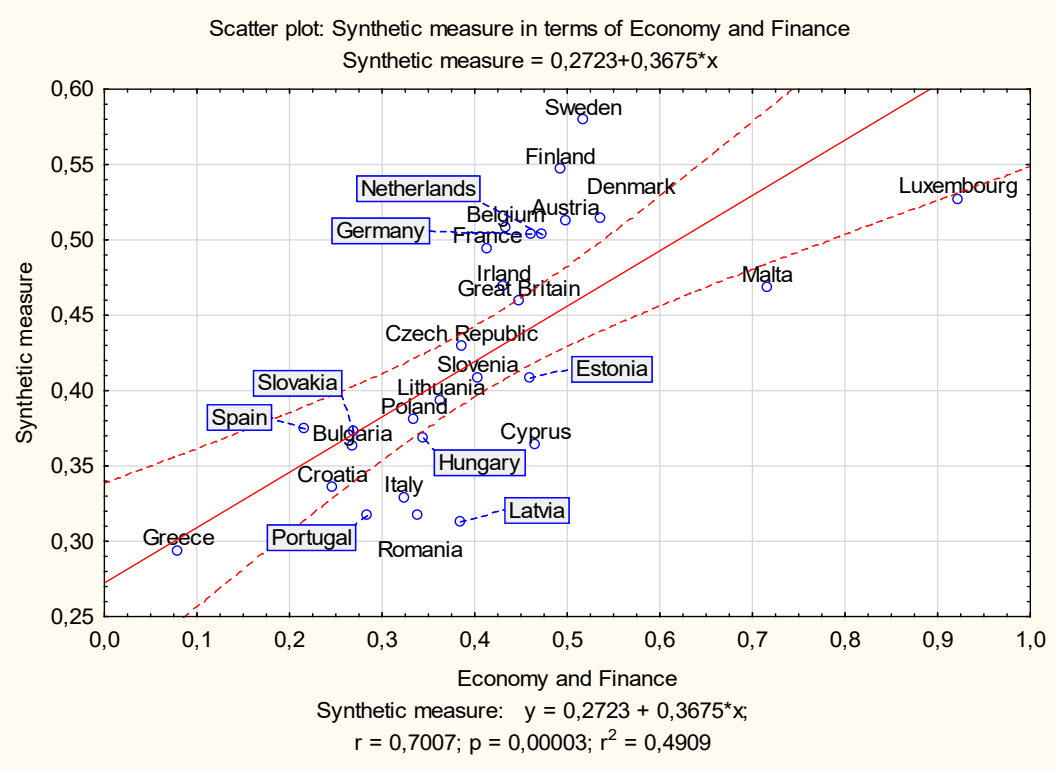

Figure 3. Regression function parameters – synthetic measure in terms of Economy and Finance (Source: author's calculations)

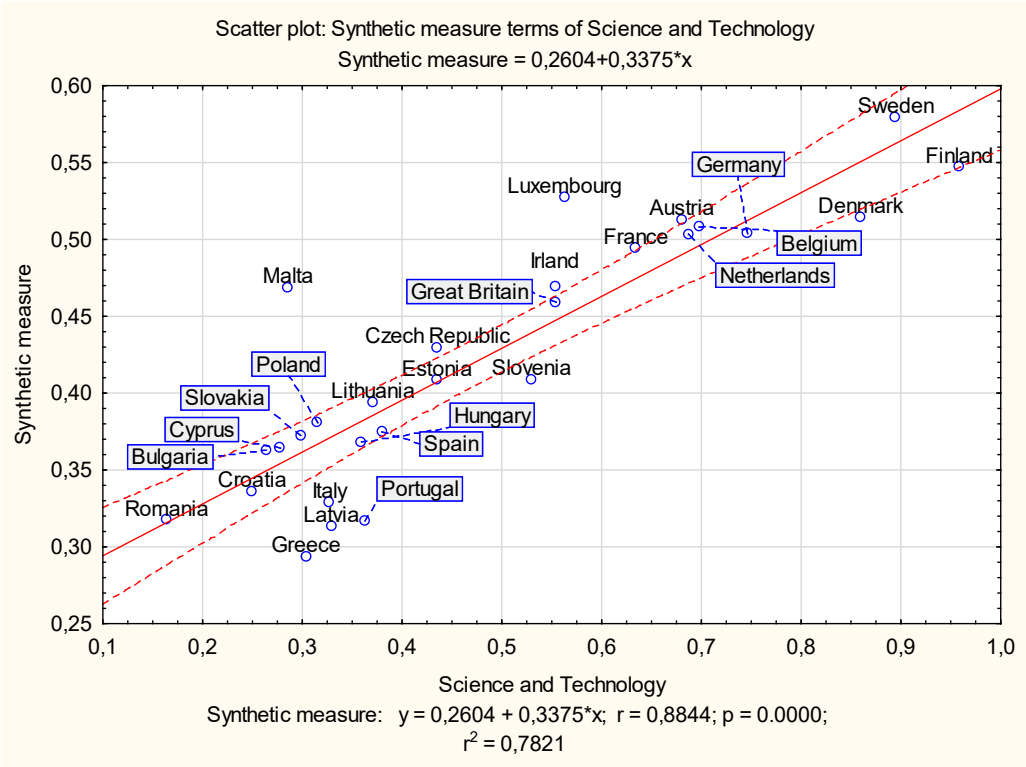

Figure 4. Regression function parameters – synthetic measure in terms of Science and Technology (Source: author's calculations)

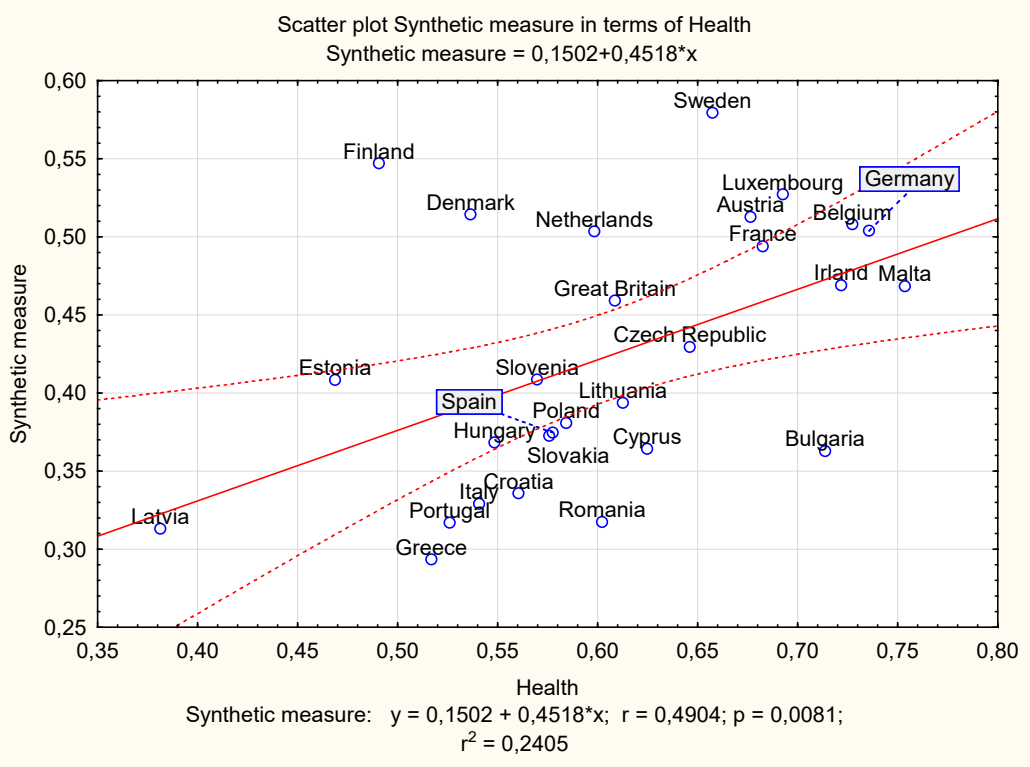

Figure 5. Regression function parameters – synthetic measure in terms of Health
(Source: author's calculations)

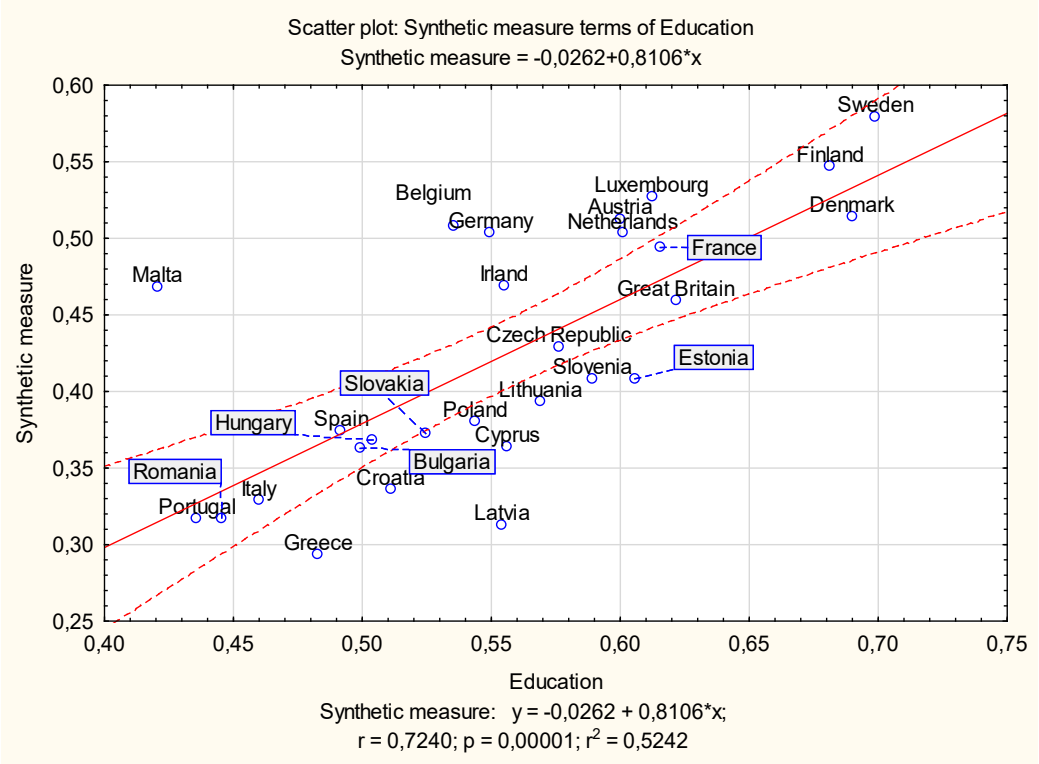

Figure 6. Regression function parameters – synthetic measure in terms of Education
(Source: author's calculations)

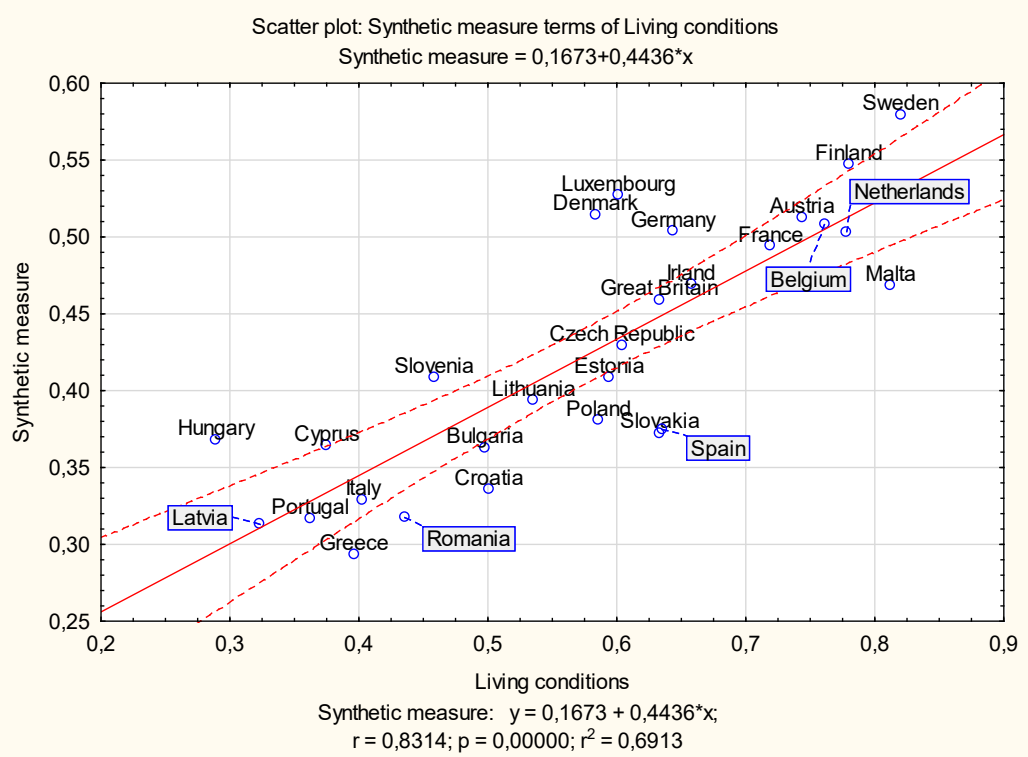

Figure 7. Regression function parameters – synthetic measure in terms of Living Conditions (Source: author's calculations)

Conclusion

Models of regression functions (presented in Figures 3-7) allowed to obtain estimated parameters for each of the determinants of socio-economic development. Their interpretation will allow to state if the synthetic measure increases, if each determinant increases by 1. This will allow to estimate which determinant has the greatest impact on the socio-economic development of EU countries. From the estimated results, it was obtained that Science and Technology (r = 0.88) and Living Conditions (r = 0.83) have the greatest impact on socio-economic development. By interpreting the parameters of the models, we will obtain that if we increase the expenditure on Economy and Finance by 1, then an increase in the synthetic measure by 0.37 will be obtained. In the case of Science and Technology, increase by 0.34, Health by 0.45, Education by 0.81, Living conditions by 0.44.

Another issue is the fact that the universally used HDI does not show the property of presenting the sensitivity of the processes taking place in individual countries. In a dynamically changing reality, there is the need for creating indicators of the conditions of social life that will be sensitive to the processes taking place in individual countries. The traditional HDI index does not show this property.

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THE SIGNIFICANCE OF PUBLIC FINANCIAL MANAGEMENT AND GOVERNANCE FOR SUSTAINABLE DEVELOPMENT

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Abstract: It is concerned with the fact that public finance is a rosy politics, a roots in economics, and the other is how the state and the state have taken their decisions; these are the most important elements shaping the macroeconomic status of a sustainable development. For sustainable development, stability in the financial markets and efficiency in management are indispensable, while the assurance element in this activity is emerging as governance. In this context, the focus of this paper will be on the significance of public financial management and governance for sustainable development. the first part of the discussion gives an overview of public financial management and governance. The second section begins by laying out the importance of public financial management and governance in sustainable development. It concludes that the relationship between sustainable financial management and governance is linked to macroeconomic frameworks, public trust, good decision making and efficient resources allocation for sustainable development.
Keywords: Public Financial Management, Governance, Global Governance, Sustainable Development, Macroeconomic Framework.

Introduction

Public financial management is a complex concept that revolves around systems, rules and laws that help in the mobilization of resources, particularly revenue, allocation of public resources, implementation of public spending as well as the accounting and auditing of the usage of public resources (Finch 2010). In this context, governance refers to the exercise of power, particularly in the management of national affairs as well as its relations with other nations. Public financial management and governance assume an imperative role in influencing the public service delivery, poverty reduction and in the attainment of sustainable development (Guinn and Straussman 2016).

According to BPP (2016), sustainable public financial management and governance are key to ensuring financial efficiency as well as strengthening transparency and accountability. Sustainable development is dependent on effective macroeconomic and development policies that allow for proper governance and private investment (Cangiano, Curristine and Lazare 2013). When pursuing development agenda, it is important to ensure that there are effective rules, institutions, and systems to facilitate appropriate management of public finances and governance. This helps in ensuring there are transparency and accountability in terms of how public resources are used (De Melo 2015).

1.Overview Of Public Financial Management And Governance

The public sector plays a crucial role within the society and overall economy of any economy. Public expenditure is one component of the economy, which largely influences the gross domestic product (GDP). According to Tennent (2008), good governance and sound public financial management are considered synonymous with sustainable economic development. Basically, public financial management and governance is a comprehensive system comprising of processes and functions relating to planning, programming, budgeting, execution of the budget, accounting for the public resources, auditing as well as evaluation (Pirdal 2017).

The aim of these activities is to ensure that there is maximum utilization of public financial resources, in accordance with the set laws (Bastida and Benito 2007) Moreover, the public financial utilization should aim at yielding maximum results. Moreover, it should be done in a transparent and accountable manner. This means that there should be effective institutions such as the legislature, to ensure that those responsible for implementing government projects and policies are held accountable (Akyüz,2014). Argues that many countries are faced by challenges related to unsustainable development, which arises due to poor public financial management due to

pursuit of ideologies such as financial populism as well as lack of effective budgetary mechanisms and financial management institutions to facilitate and oversee the implementation of public policies (Scott 2017).

According to Bevir (2011), sustainable development is achievable if the government reduces its role in the economic sphere and recognizes the important role played by the private sector in spearheading economic growth. However, the function of the government in establishing and managing effective legal as well as regulatory framework is crucial in ensuring that both the private and public sectors operate effectively and in a sustainable manner (Nummy et all.,2011). The frameworks should revolve around creating basic principle and guidelines to ensure effectiveness in economic governance and in the management of public resources (Campo,2017). It the role of the government to organize an effective financial management system that ensures that there are appropriate economic policies and that these policies are implemented with the aim of promoting sustainable socio-economic development (Allen et all.,2013).

In the contemporary world, politics and public administration have become strongly intertwined, which has raised numerous governance issues. Good governance revolves around ensuring that those who hold public offices have legitimacy and trust of the public to exercise power in the management of public resources. However, they should use the power in ensuring that the resources are used to serve the public interest and for the good of the nation. This implies that governance within the public financial management is closely linked to good governance. The mode of governance intrinsically influences how public financial resources are managed, and the overall quality of life of citizens (Martí and Kasperskaya 2015).

The only way that effective and sustainable development can be achieved is through enhanced public financial management and good governance and it can only be achieved if the three interdependent branches of state, which include legislature, executive, and judiciary, are held accountable and hold other financial management institutions accountable. Moreover, effective power relations among the executive, parliament and civil society are crucial in ensuring that all aspects of governance operate effectively (Simson et all.,2011).

2.The Importance Of Public Financial Management And Governance In Sustainable Development

The importance of sustainable development can be best understood by identifying the benefits as well as problems caused by unsustainable development, particularly in relation to governance and management of public financial resources (Wescott, 2009). According to Chibba (2009), unsustainable development often arises due to poor governance and ineffective public financial management. This is largely evident in disregard or piecemeal approach in policy development and implementation. Sustainable development largely revolves around considering the future consequences of current activities and behaviors (Freestone,2012). Unsustainable public financial management becomes manifested in different areas such as depletions of non-renewable resources, growing poverty, increase in inequality and failure in public sectors and institutions such as health, education, infrastructure, and social welfare. This leads to social and economic crisis, increased national debt, growing corruption, and depletion of resources putting future societies at risk (Draghi wet all., 2003).

Traditional public administration values remain crucial in contemporary public financial management. Such values should be based on ethical financial management to ensure that the public sector functions effectively and renders appropriate services in a timely manner (Pirdal,2017). Some of the most essential measures of public financial management and governance include budget governance, internal control, public procurement, and revenue control (Elgert,2018). For effective public financial management and governance to be achieved, there is need for effective political governance through inclusiveness, openness, compliance to rules and regulation, availability of oversight frameworks, and capacity (Rupanagunta,2006). Good governance helps bridge the wealth gap and reduces poverty levels by ensuring equitable and sustainable development. Moreover, good governance is necessary for sustainable economic growth. This is because having good governance creates an appropriate environment for private and foreign direct investment (Bevir, 2009).

According to Indrawati (2017), there is a connection between good governance and a decrease in absolute poverty levels: Level of illiteracy, infant mortality, reduction in gender inequality, and increased access to resources such

as clean water. Tennent (2008) identifies four dimensions necessary for effective public financial management. These include aggregate fiscal management, effective operational management, fiduciary risk management, and governance. These dimensions should be reflected in financial management elements such as planning, budgeting, financial reporting and performance management.

Furthermore, these dimensions help guide setting and achievement of development goals and targets. Aggregate fiscal management revolves around managing the revenues, expenditures, financing flows and other economic flows within the public finances. This is important in ensuring sustainable development by ensuring fiscal sustainability, maximizing the mobilization of resources from revenues as well as borrowing, and ensuring that resource allocation is done in accordance with the set policy priorities (Rupanagunta, 2006). In relation to operational management, sustainable development is assessed based on input versus output analysis. This is achievable through effective performance management, delivering value for public finances through effectiveness, efficiency and economy, as well as appropriate management of budget.

Governance is necessary for sustainable development and is assessed through the governance model of how public resources are managed and the role of stakeholders such as civil society and legislature in overseeing such management. For sustainable development, governance should be such that their governance structures put in place based on the interests of the stakeholders. Moreover, transparency in terms of how stakeholders access relevant information in a reliable and timely manner is important. Moreover, the sustainable government requires that individuals be held accountable in terms of how they use public resources (Agnew et all.,2015).

In relation to fiduciary risk management, sustainability should be based on risk versus cost analysis. This is achievable through putting in place effective financial control, at internal and external level. Moreover, public bodies should comply with the established constitutional, regulatory, and legal requirements, especially when dealing with public finances. Moreover, there should be appropriate oversight of public resources to ensure that they are used maximally and for the appropriate purposes (Ramkumar and Krafchik, 2005).

Conclusion and Suggestions

Sustainable financial management requires various elements, which include a legislative framework to advance financial management and accountability, appropriate governance principles to ensure financial probity, and appropriate institutions to safeguard public resources by being custodians of public finance. Failure to have in place appropriate policies and macroeconomic frameworks to implement these policies impinges on the government service delivery, programs, and even loss of finances through means such as corruption.

At this point, trust, as one of the basic pillars of global financial cash flows, also forms the basis of global governance, have a vital role in countries that supplying funds and demanding funds in global financial markets to be successful in terms of carrying out effective cost and benefit analyzes. In this context, the expenditures in budget, especially as interest payment, and the incomes in budget, especially as the taxes provided for the investments, are of great importance.

In this context, an acceleration of greater integration between public financial management and governance- as a comprehensive system- help any society for good decision making and efficient resource allocation. This holistic approach should primarily be aimed by any government to dealing with poverty and promoting sustainable development. At this point, with the concepts such as transparency, fairness and accountability, the concept of governance aimed at providing support and its implementation depends on the establishment of the infrastructure for the information society and its integration with a legal system strengthened by democracy and human rights.

Following this theoretical work, it is thought that a numerical research to be carried out in the context of observing relationship among the governance levels of countries and other indicators; such as the impact on budget performance, the increase in GDP levels, dealing with poverty, development and democratic indexes would be beneficial.

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USE OF BROMASS IN BROILER RATIONS AS A DIFFERENT PROTEIN SOURCE

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Abstract: In this study, we aimed to determine the effects of betaine-enriched β-vinasse (Bromass) on body weight, body weight gain, feed intake, feed conversion rate, carcass yield, litter quality, blood serum Ca, P and cholesterol and broiler performance index. A total of 600 Ross-308 broiler chicks were used in the experiment, and the chickens were divided into the following 4 main groups: Control (0 g/kg Bromass), Group I (5 g/kg Bromass), Group II (30 g/kg Bromass), and Group III (60 g/kg Bromass). Additionally, each of the main groups was divided into 10 subgroups of 15 chickens each. The trial lasted for 42 days. Supplementation with Bromass (5, 30 and 60 g/kg) caused significant ($p<0.05$) increases in the average body weight, body weight gain, feed intake, feed conversion rate, carcass weights and carcass yield. Additionally, bromass supplementation caused more dry litter at a significant level ($p<0.01$) and significant ($p<0.05$) decrease in serum cholesterol concentration. The addition of bromass to broiler diets resulted in a significant decrease in feed prices ($p\leq0.001$) and an important increase ($p<0.05$) in the broiler performance index values. At the end of the study, we concluded that the addition of Bromass as a different protein source, especially at the 30 g/kg level, caused positive effects and bromass makes it possible to produce a more profitable broiler.
Key Words: Betaine, broiler, bromass, cholesterol, performance, protein source,

Introduction

Feed cost in production, including in the poultry sector, is one of the most important factors affecting profitability. It is not possible to produce and consume cheap chicken meat unless the feed problem in poultry production is solved. For this reason, methods for utilizing all types of feed sources should be investigated. Utilizing by-products as alternative feeds for animals an attractive possibility due to enhanced environmental and economic concerns because most food by-products pose problems in areas of environmental protection.

Molasses is used directly as an animal feed or to obtain different fermentation products (yeast, ethyl alcohol, lysine and betaine). Another fermentation product of molasses is vinasse (Bilal et al., 2001). The chemical composition of vinasse is 48% nitrogen compounds, 10% betaine, and 5-18% potassium. Therefore, vinasse can be used as an animal feed ingredient and a source of nutrients and minerals (Lopez et al., 2011). These levels may vary according to processing conditions and extraction methods. With traditionally produced vinasse, high humidity, potassium and NPN compounds are the major factors that limit its use in poultry. However, with Beta-Vinasse (β-Vinasse), which is produced by Integro (Pak Food Production and Marketing Inc., Kocaeli, Turkey), the high potassium level, which inhibits the use of conventionally produced vinasse, has been reduced to 2% using physicochemical techniques, and the betaine content has been purified. Due to the betaine in the β-Vinasse structure, β-Vinasse has gained importance as a valuable additive in poultry feed. In animal nutrition, betaine is widely discussed as a 'carcass modifier' due to its lipotropic and growth-promoting effects (Eklund et al., 2005). Hassan et al. (2005) suggested that supplementation with betaine at approximately 3-5% in diets with adequate methyl group donors improves weight gain and feed efficiency. Additionally, the high moisture content of β-Vinasse is absorbed into sunflower seeds at a rate of 45-55%, and the result is then dried with a special process to obtain the product termed "Bromass". Thus, the dry matter level is increased to 94% in the Bromass product. Here, we added this product to broiler rations to provide original quality research.

In this study, we aimed to investigate the effects of the addition of Bromass (β-vinasse impregnated with sunflower seeds) to broiler rations as a different protein source on performance parameters, carcass parameters, blood serum parameters, litter quality and economical evaluation parameters.

Material and Methods

Animals, diets and experimental design

A total of 600 Ross 308 male broiler chicks were obtained from the Uludag University Animal Health and Production, Research and Application Centre of broiler breeding (Bursa, Turkey). The study protocol was approved by Ethics Committee of Uludag University (HADYEK decision no: 2016 -16/ 03). One-day-old chicks were obtained from a local hatchery and divided into 4 groups of 150 birds each. The chicks were individually weighed and distributed into 40 floor pens with 15 chicks per pen. Each 2.0x1.2 m floor pen was furnished with wood shaving litter. Fluorescent lamps provided 23 hours of continuous light per day. The chickens were vaccinated against infectious bronchitis and Newcastle disease (Nobilis MA5+Clone30) at 9 days of age and against Gumboro disease at 23 days of age. The experiment lasted for 42 days.

The formulations were adjusted according to phase-feeding practices (three basal diets) as the chickens advanced in age and weight and as established by the breeder (Ross 308). The basal diets were mixed under commercial conditions as one batch, divided into respective parts and then supplemented with Bromass by means of a horizontal mixer. The provided diets were prepared isocalorically (3030-3200 kcal/kg of diet) and isonitrogenously (22.38-19.43% crude protein). Diets were formulated to meet or exceed the requirements of the National Research Council (1994) for broilers at this age. The feeds and water were provided for *ad libitum* consumption. The ingredients and chemical compositions of the basal diets are presented in Table I. The chemical composition of β-vinasse is presented in Table 2. No antibiotics or growth promoters were added to any of the treatment diets. The experimental diets were chemically analyzed according to the methods of the Association of Official Analytical Chemists (2000). The metabolizable energy (ME) levels of the diets were estimated using the equation of Carpenter and Clegg (2001): ME (kcal/kg) = 53+ 38 [(CP, %) + (2.25 x ether extract, %) + (1.1 x starch, %) + (1.05 x sugar, %)]. In the study, the feeding program consisted of a starter diet until 21 d of age, a grower diet until 35 d of age and a finisher diet until 42 d of age. The birds were fed either a basal diet (control group) or the basal diet with bromass supplementation at doses of 5 (0.5%, Group I), 30 (3.0%, Group II), or 60 (6.0%, Group III) g/kg feed.

Table 1. Ingredients (g/kg) and chemical composition of the broiler rations

STARTER				
	CONTROL	**GROUP I**	**GROUP II**	**GROUP III**
Ingredients %				
Corn	53.64	53.64	52.76	51.70
Soybean meal	28.62	28.12	25.62	22.63
Full fat soybean	10.30	10.30	11.08	11.95
Corn Gluten	1.33	1.33	1.33	1.53
Vegetable oil	1.80	1.80	1.85	1.96
Bromass[3]	-	0.50	3.0	6.00
Dicalcium phosphate	1.95	1.95	1.96	1.99
Limestone	0.9	0.90	0.90	0.90
Salt	0.25	0.25	0.25	0.16
Vit-Min Premix[1]	0.25	0.25	0.25	0.25
DL-Methionine	0.34	0.34	0.34	0.20
L-Threonin	0.10	0.10	0.10	0.12
L-Lysin HCl	0.21	0.21	0.24	0.28
Sodium bicarbonate	0.10	0.10	0.10	0.10
Cholin chloride 60	0.11	0.11	0.12	0.13
Anticoccidial	0.10	0.10	0.10	0.10
Analysed concentration, %				
Crude Protein	22.38	22.36	22.32	22.37
Ether extract	6.62	6.60	6.65	6.55
Saccharose	4.66	4.65	4.70	4.78
Starch	38.03	38.59	38.59	38.22
Dry matter	90.88	90.54	90.07	90.23
Ash	10.19	10.42	9.86	9.86
Calcium	1.06	1.15	1.15	1.07
Total Phosphorus	0.73	0.78	0.78	0.71
Metabolisable energy (MJ/kg)	12.68	12.67	12.69	12.67

GROWER				
Ingredients %				
Corn	54.42	54.39	54.00	53.02
Soybean meal	18.03	17.53	15.03	12.03
Full fat soybean	14.00	14.00	14.10	14.50
Corn Gluten	2.70	2.70	2.98	3.38
Wheat	4.42	4.42	4.42	4.41
Vegetable oil	2.75	2.75	2.75	2.90
Bromass[3]	-	0.50	3.00	6.00
Dicalcium phosphate	1.61	1.61	1.65	1.69
Limestone	0.82	0.82	0.80	0.78
Salt	0.20	0.20	0.14	0.07
Vit-Min Premix[1]	0.25	0.25	0.25	0.25
DL-Methionine	0.16	0.16	0.15	0.16
L-Threonin	0.12	0.13	0.15	0.16
L-Lysin HCl	0.17	0.18	0.22	0.27
Sodium bicarbonate	0.17	0.17	0.17	0.17
Cholin chloride 60	0.08	0.09	0.09	0.11
Anticoccidial	0.10	0.10	0.10	0.10
Analysed concentration, %				
Crude Protein	20.42	20.25	20.82	20.92
Ether extract	8.94	8.08	7.56	7.28
Saccharose	5.30	5.88	5.88	5.14
Starch	38.73	40.30	40.80	41.85
Dry matter	90.33	90.35	90.27	90.58
Ash	8.58	9.27	8.58	9.77
Calcium	0.78	0.78	0.78	0.79
Total Phosphorus	0.65	0.65	0.66	0.66
Metabolisable energy (MJ/kg)	13.37	13.39	13.38	13.39
FINISHER				
Ingredients g/kg				
Corn	62.23	62.21	61.55	61.11
Soybean meal	14.50	14.00	11.50	8.62
Full fat soybean	14.41	14.43	14.40	14.60
Vegetable oil	2.00	2.00	2.10	2.20
Corn Gluten	3.23	3.23	3.82	3.82
Limestone	0.80	0.80	0.80	0.76
DCP 18	1.56	1.56	1.60	1.65
DL methyonine 99	0.13	0.13	0.13	0.13
L-Lysin	0.18	0.18	0.23	0.29
Salt	0.20	0.20	0.20	0.12
Sodium bicarbonate	0.20	0.20	0.10	0.10
Vit-Min Premix[2]	0.25	0.25	0.25	0.25
Cholin chloride 60	0.09	0.09	0.10	0.11
L-threonine	0.12	0.12	0.12	0.14
Vit-E	0.10	0.10	0.10	0.10
Bromass[3]	0.00	0.50	3.00	6.00
Analysed concentration, g/kg				
Crude Protein	19.49	19.78	20.28	19.43
Ether extract	7.75	7.45	7.68	7.66
Saccharose	5.60	5.80	4.42	5.42
Starch	41.60	42.00	42.00	42.10
Dry matter	91.63	89.85	90.28	89.96
Ash	8.79	9.93	8.85	7.86
Calcium	0.76	0.75	0.75	0.78
Total Phosphorus	0.62	0.62	0.65	0.66
Metabolisable energy (MJ/kg)	13.34	13.37	13.35	13.36

[1] R.124 STR.VM: Per 2.0 kg premix contains; Vit A 12 500 000 IU, Vit D_3 4 000 000 IU, Vit E 125 000 mg, Vit K_3 3 000 mg, Vit B_1 2 700 mg, Vit B_2 7 000 mg, Vit B_6 4 000 mg, Vit B_{12} 20 mg, Vit C 66 000 mg, Niacine 60 000 mg, Calcium d-pantothenate 15 000 mg, Folic acid 1 500 mg, Biotin 150 mg, Mn 75 000 mg, Fe 15 000 mg, Zn 60 000 mg, Cu 10 000 mg, Co 200 mg, I 1 200 mg, Organic Se 150 mg, Se 150 mg, Crina Poultry Plus 300 000 mg, Fitase 1 000 000 FTU, Xylanase 270 000 U, Beta-Glucanase 80 000 U, Fungal-1.3-B-Glucanase 70 000 U

[2] R.124 GRO. VM: Per 2.0 kg premix contains; Vit A 12 500 000 IU, Vit D_3 3 000 000 IU, Vit E 60 000 mg, Vit K_3 3 000 mg, Vit B_1 2 700 mg, Vit B_2 7 000 mg, Vit B_6 4 000 mg, Vit B_{12} 20 mg, Niacine 40 000 mg, Kalsiyum d-pantothenate

15 000 mg, Folic acid 1 500 mg, Biotin 150 mg, Mn 75 000 mg, Fe 45 000 mg, Zn 60 000 mg, Cu 10 000 mg, Co 200 mg, I 1 200 mg, Organic Se 150 mg, Se 150 mg, Crina Poultry Plus 160 000 mg, Fitase 1 000 000 FTU, Xylanase 270 000 U, Beta-Glucanase 80 000 U, Fungal-1.3-B-Glucanase 70 000 U

[3] Bromass: Contains 45% β-Vinas 55% Sunflower meal (%36 HP)

Table 2. Nutrient Composition of Bromass and β-Vinasse

NUTRIENTS		BETA VINASSE	BROMASS
Dry matter	%	63.0	94.0
Crude Protein	%	22.30	36.50
Crude ash	%	11.00	10.50
Metabolisable Energy	MJ/kg	3.91	9.12
Crude cellulose	%	0.80	10.20
Lysine	%	0.137	0.90
Meth&Cys	%	0.032	1.00
Methionine	%	0.032	0.50
Threonine	%	0.169	1.00
Valine	%	0.206	1.30
Isoleucine	%	0.136	1.00
Arginine	%	0.061	2.00
Tryptophan	%	0.0392	0.30
Calcium	%	0.0276	0.30
Total Phosphorus	%	0.0537	0.70
Sodium	%	1.41	0.90
Potassium	%	2.05	1.80
Betaine	%	20.00	11.10
D.Lysine	%	0.086	0.41
D.Meth&Cys	%	0.20	0.48
D.Methionine	%	0.21	0.29
D.Threonine	%	0.105	0.43
D.Valine	%	0.130	0.58
D.Isoleucine	%	0.084	0.62
D.Arginine	%	0.039	1.05
D.Tryptophan	%	0.024	0.25

Performance parameters

The chicks were weighed individually at the beginning of the experimental period, after which the animals were weighed weekly to calculate the body weight gain (BWG). Mortalities were recorded as they occurred. Feed consumption (FC) was recorded weekly and is expressed as kg per chicks per week. The feed conversion ratio (FCR) was calculated as kg feed per kg body weight gain. At the end of the study, to determine the carcass yield (CY), 50 male animals from each group (a total of 200 animals, 5 from each subgroup) were weighed and slaughtered under commercial conditions. The hot carcass weight was taken as the weight of the carcass after processing. The cold carcass weight was taken as the weight of the carcass after it was kept for 18 h at 4 ^{0}C. The hot and cold CY were calculated by dividing the carcass weights (CW) by the body weights.

Determinations of the European Production Efficiency Factor (EPEF) and the European Broiler Index (EBI)

For the analysis of performance indicators, including the BWG, average daily gain (ADG), FCR, viability, EPEF and EBI, the following formulas were used:

BWG (grams on period) = BW (g) at the end period - BW (g) in first d;

ADG (g/chick/d) = BWG/number of days in the growth period;

FCR (kg feed/kg gain) = cumulative feed intake (kg)/total weight gain (kg);

Viability (%) = chicks remaining at the end of the period (%);
EPEF= [BW (kg) x viability (%) / FCR (kg feed/kg gain) x age (42d)] x100;
EBI= (ADG (g/chick/d) x viability (%)) / (10 x FCR (kg feed/kg gain)).

Determination of serum biochemical values
At the end of the sixth week of the experiment, 10 birds from each pen were selected randomly, and serum samples were taken from the neck vein by puncture and drawn into Vacutainer tubes. Blood samples were collected in glass serum-collecting tubes. The blood samples were then centrifuged at 3000 rpm for 10 min. Serum Ca, serum P, cholesterol were measured by means of commercial kits.

Determination of Litter Dry Matter
Litter samples were taken from each replicate group, and dry matter analyses were performed. Litter quality was assessed in a series of samples that were obtained from five different points located at the edges and in the center of each compartment. A designated cylindrical sampler, which was 30 cm long and 8 cm in diameter, was used to obtain vertical core samples of the litter. Each sample was put in a polyethylene bag that was sealed and temporarily kept in a portable refrigerator until it was transferred to the laboratory for analyses. The analyses of the litter samples were performed immediately when the samples arrived at the laboratory of Animal Nutrition and Nutritional Disease Veterinary Faculty of Uludag University of Turkey. Following the AOAC Analytical Methods (2000), the moisture content was determined for each individual sample. The moisture contents (%) of the samples were determined by drying them at 105°C to a constant weight.

Statistical analyses
The statistical analyses were performed with the SPSS (1997) software package (SPSS Inc., Chicago, IL, USA) for Windows. Variance analysis was used to determine the significance of the differences between the statistical calculations for the groups and the mean values of the groups, Tukey tests were used as post hoc tests, and the level of significance used in all of the tests was $p<0.05$. The results are expressed as the means ± the standard errors of the mean.

Results and Discussion
The present study was conducted to investigate the effects of different levels of Bromass on the performance parameters, carcass parameters, blood serum parameters, litter quality and economical evaluation parameters of broiler chickens. The ingredients and chemical compositions of the diets are presented in Table 1. The nutrient compositions of Bromass and β-Vinasse are presented in Table 2. In summary, the β-vinasse used in this research contained 63% dry matter, 22.3% crude protein, 11% crude ash, 20% betaine and 2.05% potassium. These levels may vary according to processing conditions and extraction methods. The dry matter level was raised to 94% with the Bromass product. Bromass, which was added to the broiler rations in this study, contains 36.5% crude protein, 10.5% crude ash, 11.1% betaine and 1.8% potassium.

The results concerning the effects of Bromass on broiler performance are presented in Table 3. At the beginning of the study, there were no differences in the BW of the animals in the experimental groups. This situation demonstrates that the animals in the experimental groups were homogeneously distributed in terms of body weights. In this study, significant differences ($p<0.05$) in BW and BWG were observed. Specifically, bromass at 30 mg/kg caused a significant increase in BW and BWG during the growing and finishing periods. When we performed assessments across the overall duration of the study (1-42 days), the addition of the high level of bromass resulted in a significant ($p<0.05$) decrease in feed consumption value. In this study, significant differences ($p=0.000$) in feed conversion values between the control and experimental groups were identified in the 1-42 d period (Table 3). The best feed conversion rate in the study was observed in the group in which 30 g/kg (group II) of bromass was added to the ration. Bilal et al. (2001) determined that the effect of the addition of 2.5% vinasse to broiler diets on weight gain was significant ($p<0.05$) from 7 to 14 and 14 to 21 days of age. No difference was observed in the 35-d body weights due to vinasse feeding at the 2.5 or 5% levels. Additionally, neither the feed intake nor the feed conversion of the broilers was influenced by the treatments. The use of vinasse as a feed additive in poultry and pigs has been reported on by Stemme et al. (2005), who demonstrated an influence of this additive on animal performance. The positive effects of the addition of β-vinasse are due to its contents of yeast walls (polysaccharides and beta-glucans), minerals and B-complex vitamins. These compounds, which have been found to increase the efficiency of the utilization of nutrients, can exert effects on the immune systems of the chicken and cause the exclusion of pathogens at the digestive measurement, which therefore, produces better performing birds.

Table 3. Effects of Bromass supplementation on average body weight, body weight gain, feed intake and feed conversion rate in broiler chicks

	Control	Group I	Group II	Group III	*P*
Average Body weight (g)(n=150)					
1 day	47.67 ± 0.32	47.25 ± 0.30	47.31 ± 0.30	46.75 ± 0.28	0.185
7 day	162.39^{b} ± 1.73	167.65^{ab} ± 1.68	171.65^{a} ± 1.47	170.64^{a} ± 1.53	0.000
14 day	432.07^{b} ± 4.06	439.33^{ab} ± 4.56	449.19^{a} ± 3.84	443.74^{ab} ± 4.11	0.028
21 day	837.57 ± 8.60	848.35 ± 9.61	859.00 ± 8.38	863.59 ± 8.20	0.149
28 day	1371.55 ± 16.60	1392.41 ± 16.74	1407.17 ± 16.15	1399.11 ± 14.30	0.432
35 day	1971.27^{b} ± 24.05	2027.44^{ab} ± 25.49	2062.62^{a} ± 17.88	2028.19^{ab} ± 20.40	0.034
42 day	2605.70^{b} ± 21.78	2644.41^{ab} ± 33.37	2738.72^{a} ± 25.92	2650.16^{ab} ± 25.91	0.019
Body weight Gain (g)(n= 150)					
1-7 day	114.77^{b} ± 1.46	120.51^{a} ± 1.53	124.35^{a} ± 1.23	123.96^{a} ± 1.31	0.000
7-14 day	269.68 ± 2.70	272.06 ± 3.78	277.89 ± 2.65	273.11 ± 2.75	0.264
14-21 day	406.01 ± 5.27	409.02 ± 5.66	410.16 ± 4.99	419.85 ± 4.56	0.252
21-28 day	533.98 ± 8.89	545.32 ± 8.26	548.17 ± 8.62	537.30 ± 6.92	0.577
28-35 day	604.84^{b} ± 10.78	635.02^{ab} ± 9.99	658.81^{a} ± 7.29	629.08^{ab} ± 7.57	0.000
35-42 day	652.14^{b} ± 12.96	616.97^{b} ± 9.76	716.44^{a} ± 14.00	643.77^{b} ± 11.50	0.000
1-42 day	2558.02^{b} ± 27.90	2597.39^{ab} ± 33.14	2692.27^{a} ± 25.71	2603.83^{ab} ± 25.70	0.010
Feed Intake (g) (n=10)					
1-7 day	218.46^{a} ± 19.12	162.60^{b} ± 5.55	165.70^{b} ± 4.52	159.07^{b} ± 6.72	0.001
7-14 day	482.17^{a} ± 18.05	427.60^{ab} ± 13.47	416.74^{b} ± 12.16	467.55^{ab} ± 12.98	0.007
14-21 day	641.83 ± 30.01	607.66 ± 7.43	604.59 ± 9.10	691.12 ± 38.30	0.533
21-28 day	955.79 ± 12.73	972.20 ± 18.99	967.78 ± 20.48	955.80 ± 18.18	0.881
28-35 day	1225.90 ± 23.90	1218.64 ± 16.79	1206.85 ± 18.94	1186.20 ± 17.00	0.501
35-42 day	1481.13 ± 16.11	1473.25 ± 23.28	1441.62 ± 17.95	1412.29 ± 18.67	0.060
1-42 day	5005.28^{a} ± 31.00	4861.65^{ab} ± 64.73	4803.28^{b} ± 53.65	4772.02^{b} ± 55.08	0.017
Feed Conversion Rate (kg/kg) (n=10)					
1-7 day	1.90^{a} ± 0.16	1.36^{b} ± 0.06	1.33^{b} ± 0.02	1.28^{b} ± 0.06	0.000
7-14 day	1.79^{a} ± 0.86	1.58^{ab} ± 0.07	1.50^{b} ± 0.04	1.71^{ab} ± 0.05	0.008
14-21 day	1.58 ± 0.52	1.49 ± 0.02	1.48 ± 0.03	1.42 ± 0.10	0.295
21-28 day	1.80 ± 0.03	1.78 ± 0.03	1.77 ± 0.04	1.79 ± 0.05	0.957
28-35 day	2.05^{a} ± 0.09	1.92^{ab} ± 0.01	1.84^{b} ± 0.04	1.89^{ab} ± 0.03	0.050
35-42 day	2.29^{a} ± 0.08	2.39^{a} ± 0.04	2.01^{b} ± 0.06	2.22^{ab} ± 0.09	0.005
1-42 day	1.96^{a} ± 0.03	1.87^{b} ± 0.01	1.78^{c} ± 0.04	1.84^{bc} ± 0.07	0.000

$^{a, b, c:}$ Different superscripts in each row shows the significant difference between the groups *P<0.05 **P<0.01 ***P≤0.001

The effects of dietary treatment on carcass weight, carcass yield, litter dry matter and mortality are presented in Table 4. Significant differences (p< 0.05) between the control and experimental groups were observed in the parameters of carcass value (carcass weight and carcass yield).

Additionally, bromass addition to the broiler rations at the 30 and 60 g/kg levels caused a significant increase (p=0.002) in the dry matter of the litter. It should be remembered that the bromass additive was used as a betaine source. Rodriguez et al. (2013) determined that the carcass weights and carcass yields of birds on diets that included 30% vinasse torula yeast were lower than those birds that received 10% supplementation, although the 30% group did not differ from the control group or a group that received feed with 20% supplementation. When using vinasse as an additive (5 mL during the starter, 10 mL during the grower, and 15 mL during the finisher phases), vinasse provoked greater carcass weight (1087 and 1242 g/bird) (Hidalgo et al., 2009).

Table 4. Effects of Bromass supplementation on carcass characteristics, litter dry matter, mortality rate in broiler chicks

	Control	Group I	Group II	Group III	P
Final body weight (g)	2715.28^{b} ± 66.41	2944.50^{a} ± 44.19	2990.28^{a} ± 34.03	2933.40^{a} ± 30.64	0.000
Hot carcass weight (g)	2013.14^{b} ± 50.83	2212.64^{a} ± 32.66	2264.18^{a} ± 26.09	2221.80^{a} ± 23.91	0.000
Cold carcass weight (g)	1962.80^{b} ± 52.28	2186.48^{a} ± 32.64	2232.92^{a} ± 25.83	2194.00^{a} ± 22.89	0.000
Carcass yield (%)	72.42^{b} ± 0.90	74.28^{ab} ± 0.22	74.69^{a} ± 0.27	74.83^{a} ± 0.33	0.003
Carcass Shrink (%)	2.67^{a} ± 0.33	1.19^{b} ± 0.08	1.38^{b} ± 0.06	1.23^{b} ± 0.08	0.000
Litter dry matter (%)	22.56^{b} ± 1.95	31.63^{ab} ± 1.90	35.82^{a} ± 0.68	34.17^{a} ± 3.98	0.002
Mortality (%)	2.67 ± 1.09	3.34 ± 1.49	3.34 ± 1.49	2.67 ± 1.09	0.967

$^{a, b, c:}$ Different superscripts in each row shows the significant difference between the groups *P<0,05 **P<0,01 ***P≤0.001

Similar to the present study, increased carcass yield following betaine supplementation has been reported in broilers (Virtanen and Rosi, 1995; Firman et al., 1999; Mcdevitt et al., 2000; Wang, 2000). It would be ideal to optimize the quantity of supplemental DL-methionine with betaine, which has a positive influence on carcass meat yield (Mcdevitt et al., 2000; Waldroup, 2006). In the poultry sector, controlling litter moisture is essential for the maintenance of animal health, welfare and production performance. Some feed additives are used with the objective of directly drying litter moisture by maintaining the water balance of the birds. Osmolytes, such as betaine, affect the water balance or osmotic pressure of cells and tissues by regulating the movement of water through the cell. When poultry diets are supplemented with betaine, it is quickly absorbed by intestinal cells and balances the osmotic pressure of the gut, which contains high concentrations of inorganic salts after a meal (Trott, 2013). In other words, water loss is reduced, and the integrity of the intestinal cells is maintained. Betaine seems to be effective at maintaining intestinal water balance and drying poultry litter. In the present study, the addition of bromass to the broiler ration improved the quality of the litter by providing a stable intestinal water balance.

The results concerning the effects of Bromass on some blood parameters are presented in Table 5. In this study, the serum calcium and phosphorus levels were not affected by the levels of bromass in the broiler diets. In contrast, bromass supplementation significantly ($p<0.01$) decreased the serum cholesterol concentrations. The decreased cholesterol concentrations were 197.12, 190.40 and 186.95 in the broilers fed the diets supplemented with 5, 30 and 60 g/kg bromass, respectively, compared to the control (199.27). These results may have been due to betaine, which plays a major role in lipid metabolism, which in turn is associated with enhanced synthesis of methylated compounds in the liver and muscle including carnitine and creatine (Zhan et al., 2006). Carnitine functions in the transport of long-chain fatty acids across the inner membrane of the mitochondria where fatty acid oxidation occurs, and thus carnitine has a role in the regulation of fat metabolism (Wang et al., 2004). Accordingly, increased hormone-sensitive lipase activity (Zhan et al., 2006) following dietary betaine supplementation results in reduced lipid deposition (Eklund et al., 2005). These results are in agreement with those obtained by Jahanian and Rahmani (2008) who found that betaine enhances lipase activity and decreases the concentrations of plasma triglycerides and cholesterol in broilers and ducklings (Awad et al., 2014).

Table 5. Effects of Bromass supplementation on some blood serum parameters.

Parameters	Control	Group I	Group II	Group III	P
Cholesterol, mg/dL	199.27 [a] ± 2.96	197.12 [a] ± 1.79	190.40 [ab] ± 2.58	186.95 [b] ± 2.57	0.002
Calcium, mg/dL	7.93 ± 0.18	7.64 ± 0.34	6.71 ± 0.49	6.77 ± 0.28	0.068
Phosphorus, mg/dL	4.89 ± 0.21	5.09 ± 0.16	5.26 ± 0.18	5.51 ± 0.18	0.117

[a, b, c:] Different superscripts in each row shows the significant difference between the groups *P<0,05 **P<0,01 ***P≤0,001

The effects of bromass on the economically relevant parameters of the broilers in the trial groups are presented in Table 6. In this study, differences in the total feed consumption, feed cost, average body weight, EPEF and EBI economic parameter were determined to be statistically significant. For the overall experimental period (1 to 42 d), the bromass supplemented broilers ate less feed ($P<0.05$), required lower feed costs ($P<0.01$) and reached greater body weights ($P<0.05$). Production efficiency was assessed using the EBI and EPEF. The best EPEF and EBI values in this study were observed in the experimental groups that received feed with added bromass.

Table 6. Economic Evaluation of Trial Groups

Parameters	Control	Group I	Group II	Group III	*P*
TFC, g/chick	5005.28 [a] ± 31.00	4861.65 [ab] ± 64.73	4803.28 [b] ± 53.65	4772.02 [b] ± 55.08	0.017
FC,€/chick	1.51[a] ± 0.009	1.46[ab] ± 0.019	1.44[b] ± 0.016	1.41[b] ± 0.016	0.001
ABW, kg/chick	2605.70[b] ± 21.78	2644.41[ab] ± 33.37	2738.72[a] ± 25.92	2650.16[ab] ± 25.91	0.019
EPEF Value	309.86[b] ± 12.08	326.11 [ab] ± 5.06	353.07 [a] ± 5.48	335.38[ab] ± 9.66	0.010
EBI Value	304.21[b] ± 11.94	320.29[ab] ± 4.97	346.98[a] ± 9.56	329.48[ab] ± 5.43	0.009

Feed prices has been calculated taking into consideration the T.C. Central Bank's exchange rate dated 25.11.2016 (1 Euro=3,64₺).
(TFC) Total Feed Consumption; (ABW) Avarage Body weight; (FC) Feed Cost
(EPEF) European Production Efficiency Factor = Body weight (kg) x Viability (%) / FCR (kg feed/kg gain) x Age (42 d)
(EBI) European Broiler Index = (Avarage Daily Gain (g/chick/d) x Viability (%)) / (10xFCR (kg feed/kg gain))

Betaine supplementation may stimulate protection of the intestinal epithelium against osmotic disturbances and improve digestion, absorption and nutrient utilization in broiler chickens (Mahmoidnia and Madani, 2012). Betaine supplementation of diets with adequate methyl group donors improves weight gain and feed efficiency by

approximately 3-5% (Hassan et al., 2005). Ezzat et al. (2011) found that economic efficiency was improved by betaine supplementation in the Matrouh poultry strain from 24-36 weeks of age under hot Egyptian summer conditions. Zayed (2012), reported that the economic efficiency was increased by feeding turkeys a diet supplemented with 0.75 or 1.5 g betaine/kg in summer conditions.

Conclusion

Particularly in recent years, the spread of genetically modified soy varieties has increased the demand for natural and different protein sources. If all of the yield characteristics are taken into consideration, it is possible to safely use Bromass, which is obtained by special methods, at up to 6% in broiler rations as a performance enhancer different protein source. Moreover, we conclude that the use of Bromass at the 3% level in broiler ratios facilitated the development of chickens by optimizing the use of nutrients in the rations and thus provided an economic benefit.

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USE OF DIFFERENT GRAPHICS PROCESSING UNIT ARCHITECTURES TO ANALYZE VARIANCE IN HASH CRACKING RATE AND REAL WORLD IMPLICATIONS OF PASSWORD CREATION BY USERS

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Abstract: The study looks at using different graphics processing Unit (GPU) architectures to analyze variance in hash cracking rate and real world implications of password creation by users. The study has two tests; the first experiment is coded with a benchmark setup where the two GPU Architectures are compared based on their hash cracking rates. The second proves which GPU Architecture performs better based on mean average using t – test of Independent Means. The third shows the implications of the raw results of the first experiment, it puts into practical use of real, randomly sampled hashes collected from a leaked database. Which is then decrypted using "hashcat". The first experiment's results are put through ANOVA to see if there is variance between GPU Architecture and Hash Cracking Rate. The Pascal and Maxwell architectures are used as a sample since they represent what a user would typically have in a system. However, the use different GPU Architectures show that there is no variance between the hash-cracking rates after being tested in ANOVA, which showed a P-Value of 0.084 at a significance level of 0.05. The second experiment proves that there is a significant difference between the Maxwell and Pascal Architecture, with Pascal having the higher average. Additionally, the recent GPU Architecture (Pascal) is utilized for its practical application of Hash Cracking Rate in five trials with a preset number of hashes, which proved to be intriguing due to the time taken for the randomly sampled hashes to get decrypted. The findings may be useful in the password creation and security of all individuals that use online services that require password creation.

Keywords: Graphics Processing Unit (GPU), hash cracking, hashcat, Pascal architecture, Maxwell architecture

Introduction

The use of passwords nowadays are common, anyone with some sort of Internet presence uses a password. Passwords are what keeps our online life, such as banking, email logins, computer logins, and more safe and secure. However, these can get compromised, it can be from password leaks, user ignorance, and password cracking/decrypting. Focusing on password cracking, specifically hashtypes, these are what plaintext passwords get encrypted to when they are registered by the user, however according to Kioon, et al., (2013), hastypes such as the Message Digest 5 (MD5) hash function, which is one of the most commonly used protocols, may contain security risks.

There are many types of attacks that can decrypt hash functions, the most common are the brute force attack, and dictionary attacks. With each method of attack has its strengths regarding efficiency and time taken, however there are also downsides. Based on a review done by Suchithra, et al., (2014), there is a set spectrum of possibilities regarding password cracking attacks. This review focuses on the information available to the attacker on the victim and the corresponding type of attack to use. Focusing one type of attack, brute force, it is the use of a multitude of potential alphanumeric combinations while having the ability of using non-dictionary words on the hash making it viable for more complex passwords.

Graphics Processing Units (GPU) was chosen instead of Central Processing Units (CPU) due to the fact that GPU's have many more cores. Supported by Nickolls and Kirk (n.d.), CPU's typically have an average of 4-8 cores with 8-16 threads (as of 2017). While GPU's can have hundreds of cores with thousands of threads, with more expensive models going further than that. With this information it can be inferred that GPU's may have better processing capabilities when faced with graphically intensive workloads, or workloads that require many cores (in this case has computing). Additionally, Graphics Processing Units are found and used in many computers nowadays, their

most basic function is to render 2D and 3D graphics, images, and video that allow operating systems, graphical user interfaces, video games, and many more. The more advanced functions are used for highly multithreaded applications such as visual computing that provide real-time visual interaction with rendered objects through graphics, images, and video Nickolls and Kirk (n.d.). Graphics Processing Units are normally paired with Central Processing Units since the Central Processing Unit instructs the Graphics Processing Unit on the tasks that need to be done.

Numerous studies have been found on password cracking. Each using different methods, hardware and programs. Methods such as the brute force which tries every combination of hash, dictionary that use a predefined wordlist to compare against, and rainbow table attacks that use a space-time tradeoff algorithm that is similar to the dictionary attack. Hardware, in regards to using a different processing unit in this case using the Graphics Processing Unit (GPU) over the Central Processing Unit (CPU), since GPU's have more working cores, therefore allowing faster processing, according to Nickolls and Kirk (n.d.). Finally, the different use of hash cracking programs such as "hashcat", developed by Jens 'atom' Steube, "john the ripper", developed by Alexander Peslyak, and "cain and abel", developed by Massimiliano Montoro, all programs are open source, with each program having respective strengths and weaknesses are stated.

Useful information regarding the use of dictionary attacks can be found in (Olson, 2007) paper, which analyzed the simple ways to solve ciphers using a system called the dictionary attack, in which several optimizations were described as well as methods for effectively dealing with non dictionary words. It also reveals quantitative performance results for several variations of the approach, in addition to other implementations presented. However, the algorithm used in the experiment did not include non-English words and letters, and it was stated in the paper that it could be done provided it receives modifications.

In addition, (Weir, 2010) details new ways that information using probability can be used to maximize the success rate of hash cracking attacks. "From evaluating the usefulness of known techniques and models to creating unique techniques such as using probabilistic context others". In contrast, the paper does not cover the possibility of future ways of password creation, human nature, and future encryption technologies. While new types of prevention were created, there were also new ways to crack them.

In a similar study, (Sprengers, 2011) focuses on requirements regarding security and properties of password hashing techniques. Using a GPU to show a proof of concept that launches intensive processes to process data instead of a CPU to increase maximum hash rates. For future work, it would be able to intrigue, implement and optimize other password cracking methods, such as SHA-crypt, bcrypt, Windows NLTM, and Oracle's proprietary scheme. To add, it would be valuable to observe how Nvidia Graphics Processing Units perform compared to other chipsets manufactured by other companies.

All Processing Units (CPU, GPU, following), have what is called a core, in Central Processing Units these typically have an average of 4-8 cores. According to Nanehkaran and Ahmadi (2013), these are units that read and execute program instructions. Using common sense, more cores usually means more power, however it also means more energy is consumed. This is where threads are introduced, these threads are not physical, but they do increase the power of a processor by significantly reducing the time taken to process a command by queuing the next task beforehand. The benefits of threads range from video editing, 3D rendering and heavy multitasking.
This is supported by: Information regarding multi-core processing of Nanehkaran and Ahmadi (2013), which describes the trends of increasing speed a processor gets when more cores are added. It also shows the basic layout of a typical CPU, and shows the advantages of using certain layouts, advantages and disadvantages.

As regards to password cracking optimization methods, (Yiannis, 2013) describes the most popular types of password cracking techniques and creates optimized attacks using other techniques which optimize for performance such as the hybrid attack that utilizes rainbow table and wordlist algorithm, which used a leaked database (Phpbb) as a data set. However, at the time of data gathering, the paper's data set had not been 100% recovered (password database leak), therefore the whole list could not be used for the experiment since certain password were not recovered and multiple hashes are to be used for the experiment.

Additionally, (Kioon et al., 2013) analyzes the security strength of the Message Digest 5 (MD5) hashing algorithm and what happens if external algorithms such as salts and iterative hashing are used to further encrypt the hash. It states that the use of those external algorithms in the paper make it difficult for attackers to crack hashes as it has more characters in the hash. The researchers have also conducted an experiment with improved hashes using the external algorithms and most of time each attack or application has failed to crack the selected hash. The usage of the MD5 hashtype in this paper is towards decrypting it to show a practical application of password cracking in

terms of real world implications.

In addition to that, (Suchithra et al., 2014) describes the different types/methods of how passwords are encrypted and stored onto servers. Also, he further stated the different ways to decrypt said passwords. Out of the varying types and methods stated in the paper, this paper focuses on one method, the brute force benchmark. This attack is used since the storage requirements for the files of the dictionary attack and the rainbow table attack are too large, ranging from Gigabytes to Terabytes.

Furthermore, the study conducted by (Kulkarni, 2015) and (Chester, 2015) examines how password cracking terms and modern applications that crack passwords. It also explains how implementations of two hash-based password-cracking algorithms are developed. This study as well as Kulkarni's talk about password cracking but this study specifies on applications and utilizes only one form of attack which was used for this paper as well.

In regards to multiple types of attacks for password cracking, (Kulkarni, 2015) discusses different methods of password attacks, various countermeasures for said password attacks, different authentication methods, and an analysis of different password attacks and their relative countermeasures. As the paper focuses on the brute force benchmark, this paper gives a more defined analysis on the said attack (other attacks as well) as well as their respective countermeasures.

With regards to password cracking and its possible effects to the society, (Hranicky´ et al., 2016) explains how information (passwords in this case) was leaked by "hackers". It also touches on how forensic experts legally decipher suspects' data as well as how they conduct password recovery.

Hong, (2016) emphasized on the "rainbow tradeoff" algorithm, auxiliary techniques were used to reduce the time taken for the algorithm to complete its goal. However, it requires delicate manipulations of the random function, therefore, making it a challenging task. While these techniques were not conducted due to the current timeframe and were not part of the experiment proper, this paper gave a better insight on how password recovery can be more efficient with these said techniques. Although it required careful manipulation and holds a large amount of risks, it showed how quick and efficient password recovery can be if done correctly. Another thing to consider, it does not use other forms of algorithms but does consider the possible outcomes with errors within the used algorithm.

Nickolls and Kirk (n.d.) focuses on GPU system architectures, its framework, and describes each parts functions. The paper also featured how each feature can be used to its best performance. Additionally, the paper defines the many uses for GPU's and it's architecture. It also introduces how Moore's law interacts with GPU's.

This paper is based on a research done by Chester (2015) on Analysis of Password Cracking Methods and Applications, which focuses on the various methods of password cracking and multiple applications for password cracking with varying results with the same number of hashes. Out of all the possible methods and applications found in the research, the paper focuses on the application "Hashcat" as it is the research tool being used. "Hashcat" is a commonly used program among hackers due to it being quick and efficient. In terms of its efficiency, it has a large amount of possible hashes that can crack and can do various attacks such as the Brute Force attack that are used for the paper.

The findings of this study aims to show the relative simplicity or complexity of how passwords get decrypted. It also aims to enlighten users on password strength and how to create them properly. With the rise of new security technology, users believe that their data is safe and they have nothing to fear. However, there is also an amount of ways to get through the vulnerabilities and steal data. Every individual with an online presence is impacted since they input their passwords day to day, with more than 80% of users using the same password with different variations according to a survey done by Dalieda (2017).

This research experiment determines the correlation of the use of different Graphics Processing Unit architectures to the rate of decrypting multiple hashtypes. There are many different methods of attacks and many different types of hash functioning. The first experiment utilizes the most common hashtypes, ranging from MD4 to ArubaOS. The next experiment only uses the MD5 hashtype, since it is the most commonly used hashtype, typically obtained from leaked websites or databases. In addition, for the third experiment, hashtypes with plaintext keyspaces over eight are coded to be automatically rejected, since keyspaces with nine and above take up too much time to decrypt. Additionally, ASIC cards are not used in the research since it is not on the "consumer grade" price. Finally, brute force is used for the third experiment, to simulate a scenario where the attacker does not have access to a large dictionary file for a dictionary attack, or a large rainbow table for the rainbow table attack.

The analysis of the experiment is done for only one day, and the data of experiment one has a sample of ninety-six hashtypes, applied to both the Pascal and the Maxwell GPU Architecture. However, some of the hashtypes for the first experiment may not be processed by the GPU because of unforeseen errors. On the other hand, the third experiment contains five trials based solely on the architecture with better results in the experiment to feature the real life implications of hash cracking using the brute force attack method found in hashcat. The second experiment does not take into account the practice of "salting", which is a process that farther encrypts a hash by providing a unique decryption key. Finally, all hashtypes found in the paper are commonly used hashtypes that originate from sites such as employee database passwords, blogspot logon prompts, and so on.

The researchers would like to seek answers on the following questions:

1. Do the two different GPU architectures (Pascal and Maxwell) process hashes in a way that one surpasses the other in terms of efficiency, regardless of raw performance?
2. How fast can passwords be decrypted using hashcat with either of the specified GPU Architectures (Pascal and Maxwell)?
3. How can users improve their password strength based on the results of this research?

Materials and Methods

This research follows a repeated-measures experimental design. It analyzed the time taken and number of successful passwords decrypted collected by the researchers in a random sample of a leaked database, which allowed the testing of password vulnerability. In more detail, this was a true experimental type of research since it was based on testing various samples. Additionally each item that was examined, in this case hashtypes, were tested in their "natural environment", which was the computer. The plan of the experiment was to observe the brute force attack on a random sample and analyze the time taken to decrypt the passwords. Lastly, the goal of this research was to spread knowledge on user password creation and security.

The experiment started with the researchers using the hashcat program and created a benchmark for both of the GPU's to analyze with ANOVA. Additionally, a random sample of five hundred hashes were subjected to brute force attack for five consecutive times, the time was recorded and analyzed. The control setup for the experiment was the i3-4150 Central Processing Unit to simulate hashrates with a consumer end system. Additionally, the treatment setup was the GTX 750ti and GTX 1050ti Graphics Processing Units, for the "enhanced" hashrates and password cracking times.

In this paper, two GPU's from different generations utilized (Pascal and Maxwell) to determine if the architectures of the said GPUs' process data differently (hashes). This paper acknowledges Moore's law (1965), however it does not take the law into account since efficiency of the architectures was being observed and not the difference in raw performance.

This study was based on analyzing the rate at which a hash is cracked and what GPU Architecture was more suited for cracking hashtypes. The study was conducted on a consumer grade computer using two different GPU's. This was done because the study required the researchers to collect and code the program needed to decrypt the password. Upon completion, the study was able to identify GPU Architecture that was most effective in terms of decrypting passwords.

Results and Discussion

The study was intended to know if either of the two Graphics Processing Unit Architectures processed hashes in a different mechanism due to the different ways that the Architectures are handled. As previously stated, a sample of ninety-six (96) hash-types, and three trials for both GPU Architectures used. On this sample, the experiment was conducted to find out if GPU's are changing the way that hashes are handled by GPU's for every new generation GPU Architecture. The results were then analyzed using ANOVA to determine if there was any observable difference when it comes to variance in efficiency.

After the first experiment, the researchers found out that the Pascal GPU architecture was superior to the Maxwell architecture. In addition, after the data was tested in ANOVA, there was no evidence that there was a variation in mean of the hashrates. Therefore, the Maxwell GPU Architecture has no advantages over the Pascal GPU Architecture. In addition, both GPU Architectures were not able to complete all benchmarks due to a system error that would not allow it to proceed. During the experiment, two hashtypes were unable to get analyzed due to the following error: "clGetEventProfilingInfo(): CL_OUT_OF_RESOURCES", this indicated that the GPU

Architectures cannot process such a hash.

For the third experiment, the data gathered showed promising results. Since the practical usage of a consumer grade GPU to crack hashes was relatively simple. It took only minutes to be able to crack five hundred randomly sampled hashes in one go. However, the researchers coded the brute force attack to reject hashes that ranged greater than eight keyspaces due to the results of a pilot study conducted prior to this research, which resulted in cracking rates that estimated in an exponential growth per added key-space. Therefore, even though GPU's can process hashes with relative ease but this does not count passwords that have keyspaces greater than eight.

Table 1. ANOVA computation (experiment 1)

Source of Variation	**Df**	**SS**	**MS**	**F**	**P-Value**
Treatments	5	47648817.66	9529763.532	1.9533	**0.084**
Error	558	2722434530	4878914.928		
Total	563	2770083348			

Table 1 shows the process of ANOVA at α=0.05 and the data that was put into the test. As can be seen, the P value of 0.084 is greater than α level of 0.05. It means that there is no significant difference among the means of the groups.
However, once the groups were analyzed, the experiment shows that there is no variance between the mean average of the two groups. This means that the two GPU Architectures used in the experiment perform at similar efficiency. Additionally, this may not be the case for other solutions for hash cracking such as ASIC cards as mentioned previously.

Table 2. t - test of Independent Means

	x	sd	df	t	p	Interpretation
Pascal	1658.708	2.568	562	3.136	0.00	Significant
Maxwell	1077.422	1.759		3.136		

At α=0.05, significant if $p < 0.05$

Table 2 shows that t-test of Independent Means between the Pascal and Maxwell groups. It shows that the mean of the Pascal group is greater than the Maxwell group. Additionally, the p value of 0.00 is less than α=0.05, therefore there is significant difference between the means of the Pascal and Maxwell groups.

Table 3. Time Taken for Pascal GPU to crack 500 Hashes (experiment 2)

	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5
Pascal GPU	0:28:19	0:19:21	0:25:03	0:27:26	0:25:01
In seconds	1699s	1161s	1503s	1646s	1501s

Many promising results can be seen from the results of table 3, as it reveals the speed at which hashes can be cracked. It shows that 500 MD5 hashes can be cracked within 30 minutes. This is an alarming result, considering the hardware used in the experiment can be easily acquired and allow individuals to decrypt passwords.

However, as mentioned previously, the passwords are only limited to eight keyspaces due to the exponential processing power required to proceed further. Therefore, it may be safer to use keyspaces that are greater than eight, due to the fact that it takes more time for individuals to decrypt the hash.

Conclusion

Password security is a widespread issue in current times. Every person with any kind of online presence uses one to protect his or her information, accounts, etc. Due to the use of poor passwords created by the users, hackers are able to exploit that vulnerability and are able to decrypt their passwords. This paper has shown the theoretical and practical side of password cracking, furthermore, its implications in the real world, with the decryption of the Message Digest 5 (MD5) hashtype. Results of the study concludes that the usage of different Graphics Processing Unit (GPU) Architectures does not have a varying difference from architecture to architecture, proving that the

methods used by each Architecture to decrypt passwords is essentially the same. Elaborating further, it means that there is no specific consumer GPU Architecture that is specifically specialized for tasks such as password cracking. The results of the second experiment show how simple it is to crack hashes. Practical uses of this software paired with consumer grade GPU's can be used by hackers and potentially target a user with sensitive information, sniff their hashes, and cracking the hash within minutes.

The hypothesis of the study stated that the use of the Maxwell GPU Architecture has a hashrate mean that is more significant than the rest. The results of the study prove the hypothesis wrong with the use of one-way ANOVA. However, there are specialized graphics cards that are used by data centers and supercomputers that excel in processing large chunks of data at a time, which most of the time, hackers do not have therefore not a part of this research as mentioned previously.

Implications of this research are that newer GPU Architectures are able to decrypt passwords quicker, thereby allowing hackers to target a user, and withdraw their data, given that the user's password is within eight characters. Therefore this paper implies that users should use passwords than nine characters to circumvent a brute force attack against the user's password. However, simply using a long obvious password such as "password123" is not advisable, while it does stop the brute force attack but not the dictionary attack. Therefore, a recommended password should be a character which is over eight characters long and it should have random characters, an example would be "d#fd@g$4hs%!", which circumvents both the brute for and the dictionary attack. Finally, it is recommended to use different password for each account, so that when one account does get compromised, none of the other accounts get compromised.

In the future, studies should include testing for more GPU Architectures. In addition, the use of specialized ASIC cards as mentioned previously. This should be explored so that factors such as GPU Architectures outside of Pascal and Maxwell can be accounted to allow for more data accuracy.

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USE OF NEW TECHNOLOGIES TO PROMOTE HEALTH IN TOURISTS WHO TAKE CRUISES ON THE DOURO RIVER – PORTUGAL

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Abstract: The health and well-being of tourists who make river cruises in the river Douro should be a premise of the vessels that realize this type of cruises. This is an exploratory and cross-sectional study, where a questionnaire is being applied, consisting of socio-demographic characteristics, clinical antecedents and issues related to the use of new technologies. The data collection instrument began to be applied in April 2018 to the tourists that carry out the river cruise from Régua to Pinhão and on board the ships of the company Barcadouro. 416 tourists participated in this study. 62,7% are women and 37,3% are men, with a mean age of 54,9 years. 75,2% of the tourists saw the use of a health data platform that would allow their health surveillance to be interesting/very interesting. The existence of a mobile application and a back-office application for database management and information to be provided to tourists and tour operators, respectively, will add value to safety in terms of well-being and health.
Keywords: Data platform, Mobile application, Tourists

Introduction

Tourism in Portugal is increasingly a reality and is constantly growing. For example in 2016, 28,4 million international tourists visited Portugal, with 4,7 million tourists from Spain (25,6% of the total), 3,1 million from the United Kingdom (17,2%), 2,7 million from France (14,7%) and 1,6 million from Germany (8,5%), being that for more than half of the tourists (71,3%) this was not the first time they visited the country (INE, 2017) .

The Douro region is one of the oldest in Portugal, and has been a UNESCO World Heritage since 2001. Here it should be said that the main tourist resources and products of this region of the Douro are (Sousa, Monte, Fernandes, 2013): the wine (where the porto wine is highlighted), the river (which is navigable), the landscape, safety, tranquility and well-being, nature and architectural heritage.

River tourism, in particular on the Douro River, as in the case of tourism in general, is in an upward phase. This type of tourism includes river cruises of several hours, one day, or even several days and possibly complemented by activities of leisure, adventure, gastronomy and visits to the architectural heritage (Nunes, Moreira, Paiva, Cunha, 2016, pg .256).

The waterway of the Douro, in the Portuguese part, has 208km, 5 navigation locks (from 13 to 35 meters), about 60 river piers and develops between the mouth of the river Douro and Barca D'Alva, being the only way to travel nationally that incorporates the Trans-European Transport Network (Via Navegável do Douro, 2018)[a)].

Turismo de Portugal, in its action plan for the development of tourism in Portugal, and with regard to international trends, states that there are concerns about health, food and well-being in countries with more affordable costs, such as Portugal (Turismo de Portugal, 2016, p. 28) and where the use of technologies in travel through digital platforms for information consultation and purchase of tourism products is already a reality that has being affirming (Ibidem, 2016, p.31).

It is a fact that health tourism is also growing (Brito, 2015), which is another excellent opportunity for the economic development of the entire Douro region.

The health and well-being of tourists who frequent river cruises on the Douro River should be a premise of vessels that perform such cruises (Guy, Henson, Dotson, 2015, Kim, Woo, Uysal, 2015). And if tourists who want to take cruises, can at the time of booking, request, through mobile applications, various health services according to their needs, there is no doubt that we will be contributing to the health promotion of tourists who visit the Douro region (Ker-Cheng et all, 2014).

One of the objectives of this study has to do with the evaluation of the health needs of the tourists that go on river cruises in the river Douro and later build a backoffice application and mobile application.

Materials and Methods

This is an exploratory and cross-sectional study, where a questionnaire is being applied, consisting of socio-demographic characteristics, clinical antecedents and issues related to the use of new technologies. The data collection instrument began to be applied in April 2018 to the tourists that carry out the river cruise from Régua to Pinhão and on board the ships of the company Barcadouro.

The data was collected by 2 properly trained research scholarship students, who were oriented towards the project objectives. Data collection took place on board the ships, on the route from Régua to Pinhão, disturbing to a minimum the trip that the tourists were making. The study was authorized by the Ethics Commission of UTAD and the company Barcadouro, as well as the tourists who participated in the study gave their informed consent.

Results and Discussion

416 tourists participated in this study. 62,7% are women and 37,3% are men, with an average age of 54,9 years. 64,7% of tourists are married and 62% have higher education.
39,2% of the tourists are Portuguese and 60,8% are foreigners. Among foreigners, the nationality that stands out the most is the French with 17,1%, followed by the Brazilian with 7,9%, the Canadian with 7,7%, the German with 6,7% and the American with 6,5%, see (Table 1).

Table 1: Nationality of Foreigners

	N	%
American	27	6,5
Australian	10	2,4
Brazilian	33	7,9
Canadian	32	7,7
English	10	2,4
French	71	17,1
Germany	28	6,7
Other nationalities	32	7,7
Portuguese	163	39,2
Spanish	10	2,4
Total	416	100,0

In 2016, 946,728 tourists performed cruises on the Douro River, which represented a growth rate of 31,26% compared to 2015. 71,02% of these tourists were Portuguese, 7,08% American, 5,39% French, 3,81% English, 3,25% German and 1,13% Spanish, very similar numbers to those found in this study (Via Navegável do Douro, 2018)[b].

For 59,6% of the tourists this was the first cruise they made. The reasons for choosing this type of tourism, have to do with knowing the Douro (28,8%), for repetition of the experience (17,1%), curiosity in boating (10,6%) and family/friends invitation (10,3%), see (Table 2).

Table 2: Reasons for choosing this type of tourism

	N	%
Getting to know the Douro	120	28,8
Family / Friends Invitation	43	10,3
Curiosity in Boating	44	10,6
It was part of a tourist route	24	5,8
Repetition of the experience	71	17,1
Recreation	37	8,9
Professional Reasons	6	1,4
Spiritual retreat	2	0,5
Missing	69	16,6
Total	416	100,0

28,6% of tourists have some type of disease or limitation, and 36,1% take medication, see (Table 3). The tourists who take medication, in average, take 2.17 different medications per day.

Table 3: Health problems, medication and medical treatment

Variables		N	%
Health problems	Yes	119	28,6
	No	282	67,8
	Missing	15	3,6
Does medication	Yes	150	36,1
	No	249	59,9
	Missing	17	4,0
Does some medical treatment	Yes	41	9,9
	No	340	81,7
	Missing	35	8,4

75,3% of the tourists saw the use of a health data platform that would allow their health surveillance to be interesting/very interesting, 74,8% considered interesting/very interesting the existence of a mobile application in tour operators, to identify their health needs and 86,3% of the tourists see as interesting/very interesting the presence of a health professional (for example, a nurse) on board of the cruises, see (Table 4).

Table 4: How do you see a health data platform, a mobile application and the presence of a health professional

Variables		N	%
How would you see the use of a health data platform that would allow your health surveillance?	No interest	23	5,5
	Little Interesting	63	15,1
	Interesting	197	47,4
	Very interesting	116	27,9
	Missing	17	4,1
How would you see the existence of a mobile application in tour operators that would allow you to identify your health needs?	No interest	33	7,9
	Little Interesting	59	14,2
	Interesting	202	48,6
	Very interesting	109	26,2
	Missing	13	3,1
How would you see the presence of a health professional (for example, a nurse) on board of the cruises?	No interest	11	2,6
	Little Interesting	37	8,9
	Interesting	211	50,7
	Very interesting	148	35,6
	Missing	9	2,2

In case of re-cruising in the Douro River, 19,2% of the tourists intend to request medical/nursing care services and 11,1% assistance in emergency situations, see (Table 5).

Table 5: Re-cruising and health services

	N	%
Medical / nursing care	80	19,2
Assistance in emergency situations	46	11,1
Missing	290	69,7
Total	416	100,0

Conclusion

If the companies that perform cruises in the Douro River can provide personalized services that meet the needs and expectations of the tourists, the final result will be of greater well-being, greater satisfaction and loyalty to the company (Bauer, 2012; Lujun, Swanson, Xiaohong, 2016).

The existence of a mobile application and a back-office application for database and information management to be provided to tourists and tour operators, respectively, will add value to the safety in terms of well-being and health (Tseng, 2013; Hung-Che, Ching-Chan, Chi-Han, 2018).

It is also a reality that the creation of digital solutions in the health area, are an asset for all citizens and are a necessary bet (Ministério da Saúde, 2018, pg 73).

It is clear that mobile health applications can contribute effectively to the health promotion of the individual, however, further studies and verifications are needed to prove the creation of value for all involved (Baldwin, Singh, Sittig, Giardina, 2017).

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PARTIAL PURIFICATION AND CHARACTERISATION OF POLYPHENOL OXIDAZE FROM SWEET BELL PEPPER (CAPSICUM ANNUUM) SEEDS

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Abstract: Polyphenol oxidase (PPO) from sweet bell pepper seeds was extracted and partially purified through $(NH_4)_2SO_4$ precipitation, dialysis and gel filtration chromatography. The optimum temperature and pH values were 40 and 30 ˚C, 5.0 and 7.0 for 4-methyl catechol and catechol, respectively. Thermal inactivation of PPO was investigated at 55, 65, 75, 85 ˚C. Kinetic parametres, *Km* and *Vmax* were calculated from Lineweaver-Burk graph. The PPO activity was inhibited by SDS, sodyum azide and askorbic acid. The enzymatic properties of PPO in this study may lead to practical application for inhibition of the PPO activity and thus preventing enzymatic browning in the process of picking and storage of pepper seeds.
Keywords: Characterisation; Enzyme inhibition; Pepper seeds; Polyphenol oxidase; Purification.

Introduction

Polyphenol oxidases (PPO), (EC 1.14.18.1) belong to a set of copper containing metalloenzymes that are members of oxido reductases, which catalyze the oxidation of a wide range of phenolic compounds by utilizing molecular oxygen (Queiroz et al 2008).

Polyphenol oxidases can be found in almost all living organisms including plants, animals, fungi and bacteria. PPO is of importance because it is responsible for melanization of eye, skin, hair, and fruits and vegetables browning (Marín-Zamora et al., 2005). It is well known that the browning causes nutrient loss in tropical fruits by more than fifty per cent, resulting in reduction in the food quality, favour and taste of vegetables and fruits (Mayer, 2006).

PPO has been characterised in a wide variety of plants including lotus seed (Cai et al., 2015), African mango seeds (Sanni, 2016), grapes (Nunez-Delicado et al., 2007), potato (Lourenço et al., 1992), apricot (Arslan et al., 1998), banana (Ünal, 2007), broccoli (Gawlik-Dziki et al., 2007), mango (Palma-Orozco et al., 2013), eggplant (Mishra et al., 2012), corn tassel (Gul Guven et al., 2016), Ataulfo mango (Cheema and Sommerhalter, 2015), parsley (Gul Guven et al, 2017).

The bell pepper (*Capsicum annum* L.) is a species belong to the Solanaceae family. Pepper is widely cultivated in Asia, Mediterranean countries and Africa (Silva et al., 2013). The bell pepper comprises of various bioactive compounds along with significant amounts of beta-carotene and other similar compounds (Sun et al., 2007).

To our best knowledge, there is no any study on the PPO purification and characterisation from pepper seeds to understand and prevent the browning caused by the enzyme in food technology.

Material and Mehods

Materials and Reagents

The pepper used in this study was obtained from a local supermarket in Diyarbakir City, Turkey. It was frozen at -25 °C until used. The substrate catechol was a product of Merck (Darmstadt, Germany). Ammonium sulphate, polyethylene glycol (PEG), 4-methylcatechol, and all chemicals for electrophoresis studies were purchased from Sigma Chem. Co. All chemicals used in this study were of analytical grade.

Enzyme purification

16 grams of pepper seeds were homogenized using a blender for 10 min in the extraction solution (0.1 M phosphate buffer at pH 6.5 containing 4% PEG and 10 mM ascorbic acid). Double layered filter paper was used to filter the homogenate. The centrifugation of extract samples was carried out at 15000 g for 20 min at 4ºC. 60 % Ammonium sulphate, $(NH_4)_2SO_4$ saturation was obtained by adding solid ammonium sulphate slowly to the supernatant under cold conditions. The centrifugation was carried out at 15000 g for 30 min to separate the precipitated proteins. Enzyme extract was then re-dissolved in a small volume of buffer (0.05 M phosphate, pH

6.5) and finally dialysed at 4ºC in the same buffer overnight with three changes of buffer during whole process. The samples as enzyme source were kept at 4ºC until use in the following experiments.

Enzyme activity
PPO activity was determined using a spectrophotometric method based on the initial rate of increase in absorbance at 420 nm. PPO assay was carried out in 3 ml reaction mixture containing 0.1 ml of substrates, catechol or 4-methylcatechol (0.1 M) and 0.1 ml of enzyme sample in phosphate buffer (0.1 M, pH 6.5). The PPO activity was measured at 420 nm using a spectrophotometer. The blank consisted of 2.9 ml buffer and 0.1 ml substrate. One unit of enzymatic activity was defined as the amount of enzyme that caused a change in absorbance of 0.001 per min.

Protein determination
Protein content was determined for every purification step by Bradford (1976) method using bovine serum albumin as the standart**.**

Effect of temperature and pH on PPO activity
Different temperatures in the range of 20-90°C were tested in order to determine the optimum temperature for PPO activity using catechol and 4-methylcatechol as substrate. The optimum pH was investigated using various buffers: 0.1 M sodium acetate buffer (pH 3-5) and 0.1 M sodium phosphate buffer (pH 6.0-10.0). The optimum pH which corresponds to the highest PPO activity was used for the study in order to determine the effect of inhibitors and temperature on enzyme activity.

The thermal stability of the PPO
The purified enzyme was examined at 55, 65, 75, 80 °C for various times (5,10 and 15 min) to determine the thermal stability of the PPO, after which the residual activity was measured under standard condition.

Substrate specificity
Michaelis-Menten constant (*Km*) and maximum velocity (V_{max}) values of PPO were calculated using the substrates catechol (1-15 mM) and 4-methylcatechol (1-18 mM) under the optimized pH and temperature conditions. A plot of 1/*V* versus 1/[S] by using Lineweaver and Burk (1934) method was utilised to obtain *K*m and *V*max values of PPO for each substrate.

Effect of inhibitors on enzyme activity
The effects of several inhibitors (ascorbic acid, sodyum azide, SDS and EDTA) on PPO activity were determined. PPO activities were measured at two constant inhibitor concentrations (0.5-2 mM) with 10 mM concentration of 4-methyl catechol as substrate.

Results and Discussion

Extraction and partial purification of PPO
Table 1 shows the purification steps of pepper seed PPO which include precipitation by ammonium sulphate, dialysis and size-exclusion chromatography. As can be seen from Table 1, PPO spesific activity increased at subsequent steps of purification. At the mean time, the protein content highly decreased at the final stage as expected. In this study, the purification level obtained was 2.23-fold with 10 % recovery of PPO activity (Table 1). In a previous study, purification fold of 10 with a recovery of 18.47 % for PPO in corn tassel was obtained (Gul Guven et al., 2016).

Effect of pH and temperature
As can be seen in Figures 1 and 2, the optimum pHs for catechol and 4-methyl catechol were found to be 7.0 and 5.0 for, respectively. Most of fruits and vegetables show maximum activity near neutral pH value (Sakiroglu et al., 2013). Several previous studies also reported that optimum pH values for PPO in various plants were 7.0 for lotus seed (Cai et al., 2015), Jackfruit (Tao et al., 2013), Amasya apple (Oktay et al., 1995), artichoke (Doğan et al., 2005), pH 7.2 for Barbados cherry (Kumar et al., 2008), pH 8.0 for corn tassel (Gul-Guven et al., 2016), using catechol as a substrate, whereas pH 5.4 for Ataulfo mango (Cheema and Sommerhalter, 2015), pH 4.5 for strawberry (Wesche-Ebeling and Montgomery, 1990) using 4-methyl catechol as a substrate.

Steps	Volume (ml)	Total Protein (mg)	Total Activity	Specific activity (unit/mg protein)	Purification (fold)	Recovery (%)
Crude enzyme	17,5	11.20	3344	298.5	1	100
$(NH_4)_2SO_4$ precipitation and dialysis	6	4.7	2270	483	1.61	67.8
Gel filtration chromatography	3	0.5	333	666	2.23	10

Table 1 . The purification of PPO from pepper seeds

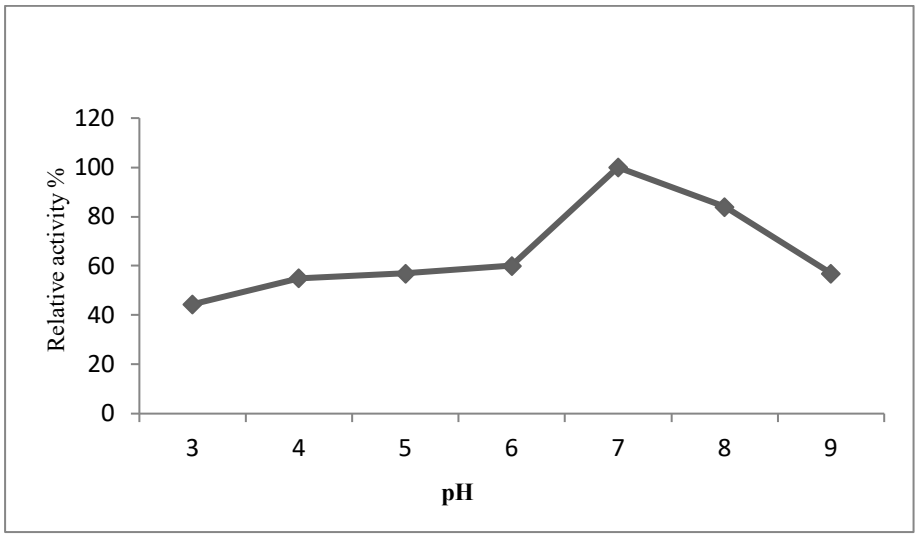

Figure 1. Effect of pH on PPO with catechol as substrate.

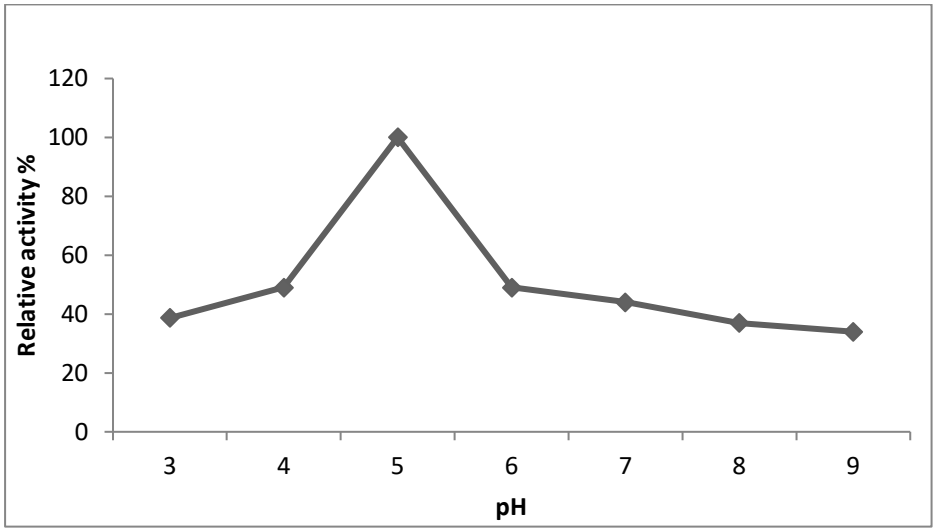

Figure 2. Effect of pH on PPO with 4-metilcathecol as substrate**.**

Optimum temperature activities were found as 30°C and 40°C for catechol and 4-methyl catechol as substrates, respectively (Figures 3 and 4). It has been previously reported that different plants exhibited different optimum temperatures. The examples are 40 ºC for artichoke (Doğan et al., 2005), 35 ºC for mamey (Palma-orozco et al., 2011) and 20 ºC for lotus seed (Cai et al., 2015) using catechol as the substrate, while 56 ºC for Amasya apple (Oktay et al., 1995) and 30 ºC for aubergine (Dogan et al., 2002), using 4-methyl catechol as the substrate.

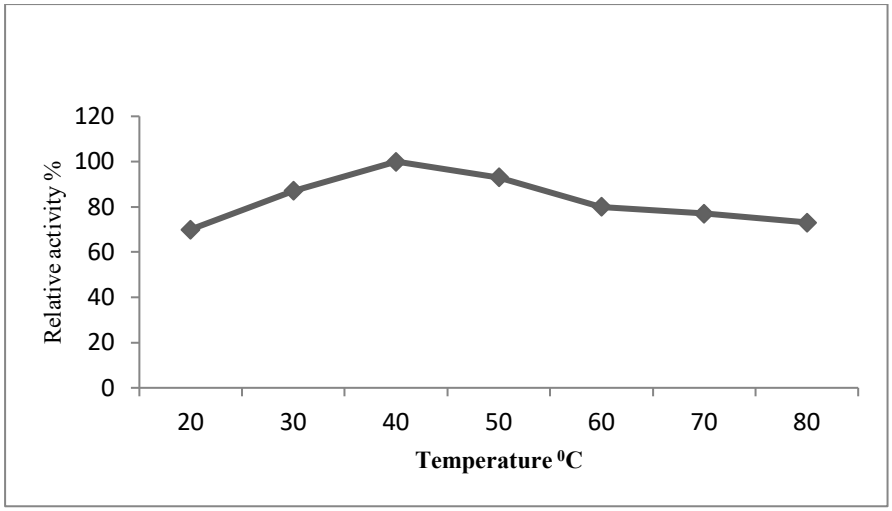

Figure 3. Effect of temperatureon PPO with cathecol as substrate**.**

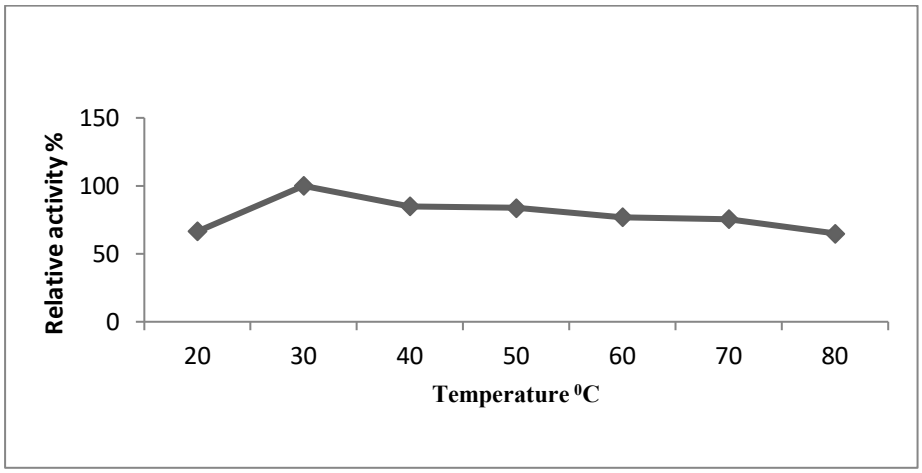

Figure 4. Effect of pH on PPO with 4-metilcathecol as substrate.

Kinetic characteristics of PPO using different substrates

For the determination of Michaelis-Menten constant (*Km*) and maximum velocity (*Vmax*) values of the enzyme, PPO activities were determined using the concentrations of the substrates catechol (1-15 mM) and 4-methylcatechol (1-18 mM) under optimized temperature and pH conditions. The values of Km and Vmax calculated from the plot analysis of polyphenol oxidase were 0.83 mM and 0.3317 abs/min for catechol, 0.732 mM and 0.5060 abs/min for 4-methylcatechol, respectively. 4-Methylcatechol seemed to be the best substrate as the comparison of the Vmax and *V*max/*K*m for two substrates tested showed a higher value for 4-methylcatechol, which was used at subsequent experiments.

Many studies have been carried out about PPO kinetics in different plants, using catechol and 4-methyl catechol as substrates. When using catechol as the substrate, Km values for PPO of Jackfruit (Tao et al., 2013), mamey (Palma- Orozco et al., 2014), Chinese Toon (Wang et al., 2013) were found as 8.2 mM, 44 mM and 10.059 mM, respectively. However, Km values were 3.14 mM in mango (Palma- Orozco et al., 2014), 18.2 mM in Jackfruit (Tao et al., 2013) and 24.6 mM in De Chaunac grape (Lee et al., 1983) when 4-methyl catechol used as the substrate.

Effect of inhibitor

The effects of some inhibitors such as sodyum azide, ascorbic acid, SDS and EDTA on polyphenoloxidase activity were examined at two constant inhibitor concentrations using 4-methyl catechol as substrate. The PPO activity was inhibited by the concentrations of EDTA, SDS, sodyum azide and ascorbic acid tested. The most effective inhibitors were askorbic acid and sodyum azide.

The thermal stability of the PPO

PPO stability decreased with the temperature increase. All temperature treatments, except of 85 °C, could not completely inactivate the PPO activity. PPO from different sources exhibit different heat resistance. Sanni (2016) reported that enzyme from two species of African Mango was thermally stable at 40 ˚C and 50 ˚C.

Conclusions

The aim of this research is to refine and characterise the PPO enzyme in the seed of green pepper grown in The Southeastern Anatolia in Turkey. For this aim, the enzyme isolated from the seed of pepper was refined later with ammonium sulfate sedimentation, dialysis, ultrafiltration and gel filtration chromatography. Kinetic features of enzyme, the optimum pH and temperature, temperature inactivation and the effects of some inhibitors have been studied.

Polyphenol oxidase extracted from seed of green pepper was purified by 2.23 fold with 10 % protein yield. Optimum temperature activities were for 30°C and 40°C for catechol and 4-methyl catechol as substrates, respectively. The optimum pH values were 7.0 and 5.0 for catechol and 4-methyl catechol respectively. 4-Methylcatechol was more preferred by the enzyme, when compared to catechol, as shown by the Lineweaver-Burk analysis. The results also showed that, EDTA did not have any affect on PPO activity, wheras the enzyme inhibition was 64.4 % by sodium azide, 36.2 by % SDS and 65.7 % by asorbic acid. The PPO was found to be stable to heat up to 85 °C.

The enzymatic characteristics of PPO could provide practical application in inhibiting the PPO activity to understand and prevent the enzymatic browning in the process of picking and storage of pepper seeds. To prevent the enzymatic browning of seeds of green pepper in industry, it might be advatageous to treat the seeds with some PPO inhibitors defined in this study.

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