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1st International Symposium on Multidisciplinary Studies and Innovative Technologies

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OLEOGEL AS A NOVEL INGREDIENT

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Abstract

Oleogel (edible oil gels) is the product of organogelation technique when the organic phase is edible oil. This novel technique is generally described in which the entrapment of an organic liquid within a three dimensional gel network is created. This three dimensional gel network must be thermo-reversible. The organogelators is needed for this gelation reaction and, the physicochemical properties of organogelators are i) affinity for oil, surface activity and self-assembling properties, ii) displaying thermo-reversible properties such as crystallization, and iii) under going higher structural arrangement based on supramolecular interactions. These organogelators can be classified into two groups, first one is low molecular weight gelators and the second one is polymeric gelators. Low molecular weight gelators include fatty acids or alcohols, waxes, phytosterols, oligopeptides and lecithins. The most common polymeric gelator is the cellulose derivative ethyl cellulose.

Oleogel utilization showed increases in cosmetic and pharmaceutical industries, and also in food industry after the late 1990's. There are only a few studies which conducted on the utilization of oleogels in meat products. As known, solid lipid phases, which are commonly structured by the formation of crystalline triacylglyserol network, play an important role in meat products by promoting solid structure and texture of fats. However, the intake of saturated and trans fatty acids could be resulted in cardiovascular diseases, several types of cancer and obesity. For these reasons, meat industry focused on researching for new, healthier alternative products. From the point of view of healthier meat products, oleogel could be an alternative food ingredient. The objective of this review is to describe the properties of oleogels and the utilization in meat products.

Keywords: *Edible oil gel, oleogel, oleogelator, meat products*

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ELECTRONIC NOSE SYSTEMS FOR EVALUATION OF MEAT QUALITY

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Abstract

Meat products need to be monitored to ensure the consumer's safety as consumption of spoiled meat and/or products can be resulted in serious health hazards. Although meat is a perishable raw material, the freshness of meat and/or products degrades as a result of biochemical reactions and microbial activity. These reactions cause changes in colour and odour. For odour detection, gas chromatography systems such as gas chromatography/chemiluminescence and gas chromatography/ mass spectrometry are mostly used. On the other hand, these instruments are destructive, time consuming and very expensive. In the last decades, electronic nose with sensor technology have been developed for odour detection for all foods. The electronic nose system mimics the sense of smell and can be defined as an instrument that comprises an array of electronic chemical sensors with partial specificity and proper pattern recognition system which is capable of recognizing simple or complex odours. Most popular sensors are metal-oxide semiconductor, conducting polymer and surface acoustic wave sensors. The objective of this review is to describe the electronic nose instrument and the evaluation of meat freshness with electronic nose.

Keywords: *Electronic nose, meat freshness, sensors, unpleasant odour*

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WHY SHOULD WE DRINK KOMBUCHA?

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Abstract

Kombucha is a beverage produced by fermentation of sweetened tea due to symbiotic relationship between yeasts and acetic acid bacteria species. Kombucha is also known in the world as Champignon de longue vie, ling zhi, kocha kinoko, chainii grib and chainii kvass. In many countries, kombucha production is carried out industrial scale as well as traditional production. Black tea, green tea and oolong tea are generally used as substrates in production of kombucha. In addition, this beverage is rarely produced using melissa, mulberry, jasmine and mint.

The tea fungus is association of yeasts (*Saccharomyces cerevisiae*, *Saccharomyces inconspicus*, *Saccharomyces ludwigii*, *Schizosaccharomyces pombe*, *Candida tropicalis*, *Candida krusei*, *Debaryomyces hansenii*, *Brettanomyces* spp., *Kloeckera* spp., *Zygosaccharomyces bailii*, *Zygosaccharomyces kombuchaensis*, *Torulospora* spp., *Pichia* spp., *Mycotorula* spp., *Mycoderma* spp., etc.) acetic acid bacteria (*Acetobacter xylinum*, *Acetobacter xylinoides*, *Bacterium gluconicum*, *Acetobacter suboxydans*, *Gluconobacter liquefaciens*, *Acetobacter aceti*, *Acetobacter pasteurianus* etc.) and lactic acid bacteria (*Lactobacillus bulgaricus*). In kombucha fermentation, yeasts hydrolyze sucrose dissolved in the cultivation medium into glucose and fructose by invertase enzyme and convert glucose and fructose to ethanol. Then, ethanol is oxidized into acetic acid by acetic acid bacteria. Morover, acetic acid bacteria can convert glucose to gluconic acid and fructose to acetic acid while ethanol is produced by yeasts. Acetic acid, ethanol, and gluconic acid are the major chemical compounds of kombucha. Other components exist in kombucha are glucuronic, citric, L-lactic, malic, tartaric, malonic, oxalic, succinic, pyruvic, usnic, 5-ketogluconic acid, 2,5-ketogluconic acid, some water soluble vitamins, amino acids, purines, pigments, some hydrolytic enzymes, minerals, carbon dioxide and some tea components such as polyphenols catehins, theaflavins, flavonols. In relation to these components, Kombucha has many prophylactic and therapeutic effects on human health. Kombucha can reduce blood pressure, cholesterol level, inflammatory problems, atherosclerosis, obesity, enhance the immune system, liver functions, body resistance to cancer, relieve arthritis, rheumatism, gout symptoms, bronchitis and asthma, stimulate glandular systems, interferon production, protect against diabetes, facilitate excretion of toxin besides blood cleansing and have an antibiotic effect against bacteria, viruses, and yeasts.

Keywords: *Kombucha, fermentation technology, traditional medicine, tea*

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PHENOLIC COMPOUNDS IN OLIVE LEAF

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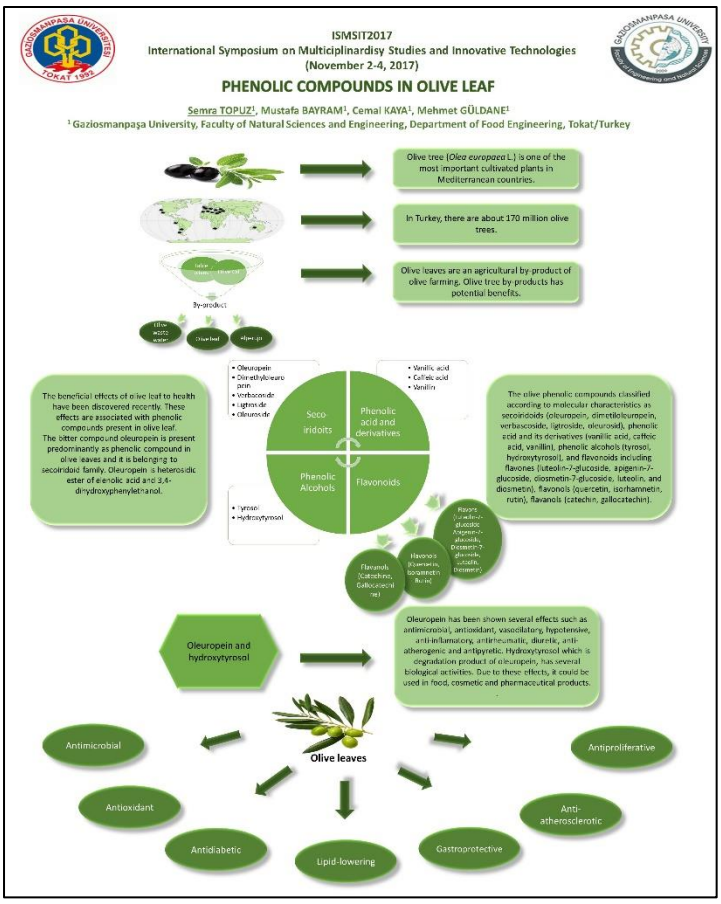

Abstract

Olive tree (*Olea europaea* L.) is one of the most important cultivated plants in Mediterranean countries. In Turkey, there are about 170 million olive trees. Olive leaves are an agricultural by-product of olive farming. Olive tree by-products has potential benefits. The beneficial effects of olive leaf to health have been discovered recently. These effects are associated with phenolic compounds present in olive leaf. They are classified in comparison with molecular characteristics as secoiridoids (oleuropein, dimetiloleuropein, verbascoside, ligtroside, oleurosid), phenolic acid and its derivatives (vanillic acid, caffeic acid, vanillin), phenolic alcohols (tyrosol, hydroxytyrosol), and flavonoids including flavones (luteolin-7-glucoside, apigenin-7-glucoside, diosmetin-7-glucoside, luteolin, and diosmetin), flavonols (quercetin, isorhamnetin, rutin), flavanols (catechin, gallocatechin). The bitter compound oleuropein that is present predominantly as phenolic compound in olive leaves, is belonging to secoiridoid family in the olive trees. Oleuropein is heterosidic ester of elenolic acid and 3,4-dihydroxyphenylethanol.

Oleuropein has been shown several effects such as antimicrobial, antioxidant, vasodilatory, hypotensive, anti-inflamatory, antirheumatic, diuretic, anti-atherogenic and antipyretic. Hydroxytyrosol which is degradation product of oleuropein, has several biological activities. Due to these effects, it could be used in food as well as food additive production, cosmetic and pharmaceutical products. The olive leaves have a important effect on regulation of blood sugar level. The hypoglycemic activity of olive leaf compounds may derive from potentiation of glucose-induced insulin release and increased peripheral uptake of glucose. Olive leaf extract inhibit low density lipoprotein (LDL) oxidation, thus it can be used treatment of cardiovascular diseases. Olive leaf extract which has been shown to be effective against viruses, retroviruses, bacteria, yeasts, fungi and other parasitesthese. Morover, It has antioxidant properties based on phenolic compounds. Many reports have shown that olive leaf extract has a lot of other effects such as antihypertensive, antidiabetic, antiproliferative, anti-atherosclerotic, apoptotic, gastroprotective, radioprotective and lipid-lowering.

Keywords: *Olive leaf, phenolic compounds, oleuropein, hydroxytyrosol*

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VEGETABLE-BASED MIXED DRINK PRODUCTION

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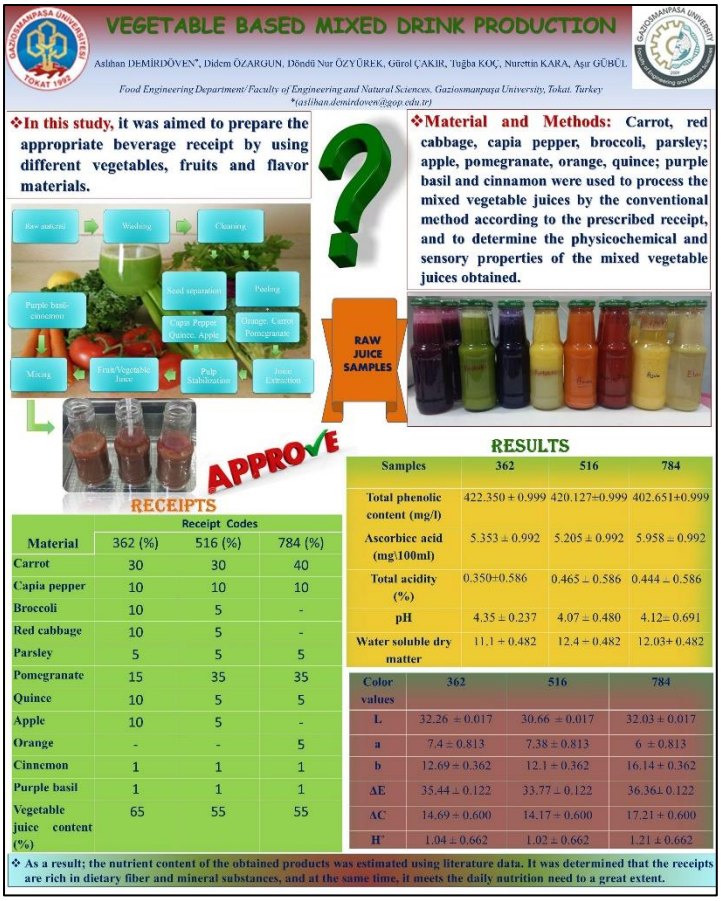

Abstract

In this study, it was aimed to prepare the appropriate beverage receipt by using different vegetables, fruits and flavor materials.

Carrot, red cabbage, capia pepper, broccoli, parsley; apple, pomegranate, orange, quince; purple basil and cinnamon were used to process the mixed vegetable juices by the conventional method according to the prescribed receipt, and to determine the physicochemical and sensory properties of the mixed vegetable juices obtained.

Amount of phenolic substance, ascorbic acid content, titratable acidity, pH and total soluble solids content were found in the range of 402.651-422.350mg/L, 5.205-5.958 mg/100mL, 0.350-0.465%, 4.07-4.35 and 11.1-12.4%, respectively. Color values of L, a and b were found in the range of 30.66-32.26, 6-7.4 and 12.1-16.14, respectively. Total color difference (ΔE) and croma values (ΔC) were found in the range of 33.37-36.62 and 14.18-17.21, respectively. H value was found in the range of 21.28-34.92. The nutrient content of the obtained products was calculated using literature data. In conclusion, it was determined that the receipts are rich in dietary fiber and mineral substances, and at the same time, it meets the daily nutrition need to a great extent.

Keywords: *Fruit, vegetable, mixed drink, receipt, quality.*

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High Temperature Mechanical Properties of Advanced Ceramics

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Abstract

Advanced ceramics have been intensively investigated over many years due to their excellent mechanical, chemical and thermal properties. These properties make them candidate for potential applications. Silicon nitride based ceramics, which are one of the advanced ceramics, have also unique properties such as high strenght, hardness, toughness and good oxidation and creep resistance. In this study, high temperature mechanical properties of silicon nitride based ceramics were investigated by high temperature mechanical tests.

Silicon nitride based ceramics have excellent properties offer great potential in structural and high temperature applications. High temperature properties of these materials play important role for high temperature applications. Experimental studies are generally necessary to determine high temperature behaviour of materials. Experimental part of this study has 3 main steps. First one is are production of test specimens. Specimens were produced by gas pressure sintering method after initial shaping and de-binding process of starting powder. Second step is testing of specimens. The tests were performed at room and high temperatures in flexure mode. Final step is microstructural characterization of samples. Microstructure of samples were investigated by scanning electron microscope (SEM) after preparation tested samples.

After gas pressure sintering, full dense test specimens were produced. Room and high temperate tests performed successfully. Average room temperature flexure strenght of material was determined to be 800 MPa. High temperature flexure strenght of material decreased to 40 % of room temperature flexure strenght. The grains and grain boundaries were observed by SEM microstructural characterization of samples.

Keywords: *advanced ceramics, silicon nitride, high temperature mechanical properties, flexure, microstructure*

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The Effect of Barley Flour on Quality Criteria of Biscuit in Biscuit Production

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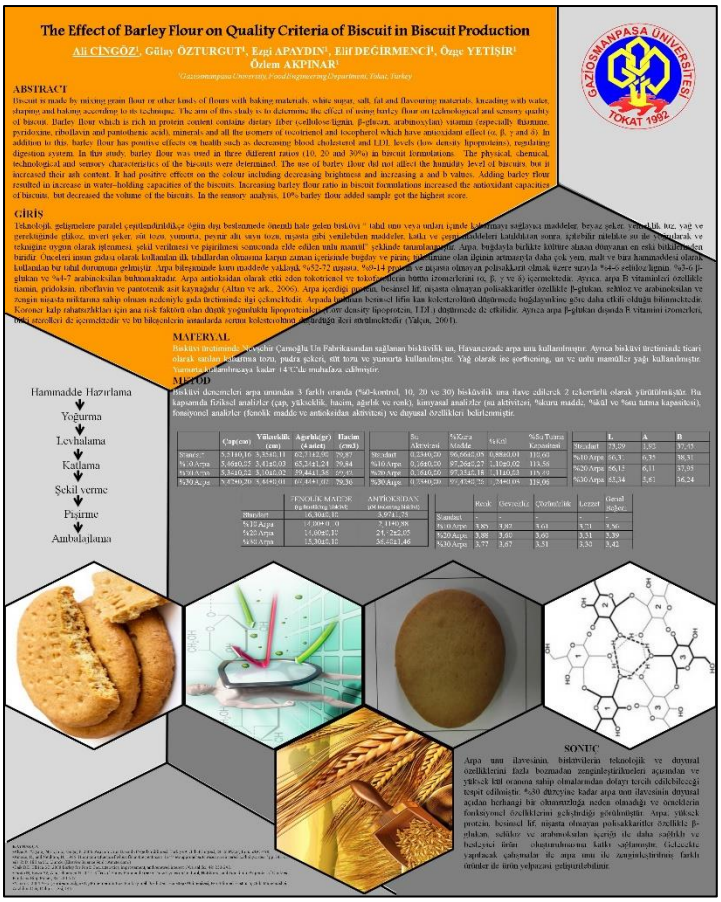

Abstract

Biscuit is made by mixing grain flour or other kinds of flours with baking materials, white sugar, salt, fat and flavouring materials, kneading with water, shaping and baking according to its technique. The aim of this study is to determine the effect of using barley flour on technological and sensory quality of biscuit. Barley flour which is rich in protein content contains dietary fiber (cellulose/lignin, β-glucan, arabinoxylan) vitamin (especially thiamine, pyridoxine, riboflavin and pantothenic acid), minerals and all the isomers of tocotrienol and tocopherol which have antioxidant effect (α, β, γ and δ). In addition to this, barley flour has positive effects on health such as decreasing blood cholesterol and LDL levels (low density lipoproteins), regulating digestion system. In this study, barley flour was used in three different ratios (10, 20 and 30%) in biscuit formulations. The physical, chemical, technological and sensory characteristics of the biscuits were determined. The use of barley flour did not affect the humidity level of biscuits, but it increased their ash content. It had positive effects on the colour including decreasing brightness and increasing a and b values. Adding barley flour resulted in increase in water–holding capacities of the biscuits. Increasing barley flour ratio in biscuit formulations increased the antioxidant capacities of biscuits, but decreased the volume of the biscuits. In the sensory analysis, 10% barley flour added sample got the highest score.

Keywords: *Biscuit, Barley flour, Functional food*

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PRODUCTION OF A CASTING MOLD AND PRODUCT DESIGN PREPARED BY USING COMPUTER-AIDED PROGRAMS FROM COMPOSITE MATERIALS

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Introduction

The importance of composite materials in engineering applications is rapidly increasing, and their areas of usage in the industry are gradually becoming widespread. In this study, it has been aimed to prepare a mold by using the hand lay-up method which is one of the composite material manufacturing methods and then to carry out the manufacturing of a composite product (mirror frame) designed prepared with using computer aided design (CAD) programs, by means of casting in this mold.

Methodology

In this study, the mirror stem design prepared in SolidWorks program (Fig.1) was reduced to the smallest unit once again by using the program named Pepakura Designer and it was made 2D (Fig.2 a). The design converted into a 2D production drawing was printed on cardboard 1.6 mm in thickness and it was made a model by joining by the solvent-based adhesive (Fig.2 b). With the hand lay-up method, a casting mold was created by using 40% fiberglass and polyester resin material with the help of a cardboard model.

Marble powder/polyester were mixed in a way that they would be at 3-ratio by mass and were added to the casting mold to the mold surface of which a mold release agent was applied. Accelerator at the rate of 0.1 % (cobalt salt) and hardener (diluted methyl ethyl ketone peroxide at the rate of 30%) were added to the mixture. After drying, the pieces were taken out of the mold, the procedure was repeated until the repetition number necessary for the designed mirror was achieved. After the casting process of all pieces had been completed, the pieces were joined by using an adhesive in a way which would be suitable for the surface preparation and similar processes employed in the adhesion of polymers. The mirror stem put for drying for 24 hours was later subjected to the coloring process (Fig. 5).

Figure 1. Mirror stem design prepared in SolidWorks

Figure 2. a) 2D design prepared in Pepakura Designer b) Cardboard Model

Figure 3. Casting mold was created by using glass fiber

Figure 4. Cast piece

Figure 5. Mirror stem after coloring process

Results and Discussion

It was observed that the processes were repeatable in the mold prepared and the molds prepared by computer-aided design programs and produced from 40 % fiberglass and polyester resin were usable. It is considered that this type of molding applications and design programs will be intensively used in the future for products without mass production or for products the prototype of which will be created.

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Abstract

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Keywords: *Composite, polymer composite, fiberglass, computer aided design (CAD), polymer casting*

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Review: PEF application in Rose Oil Distillation

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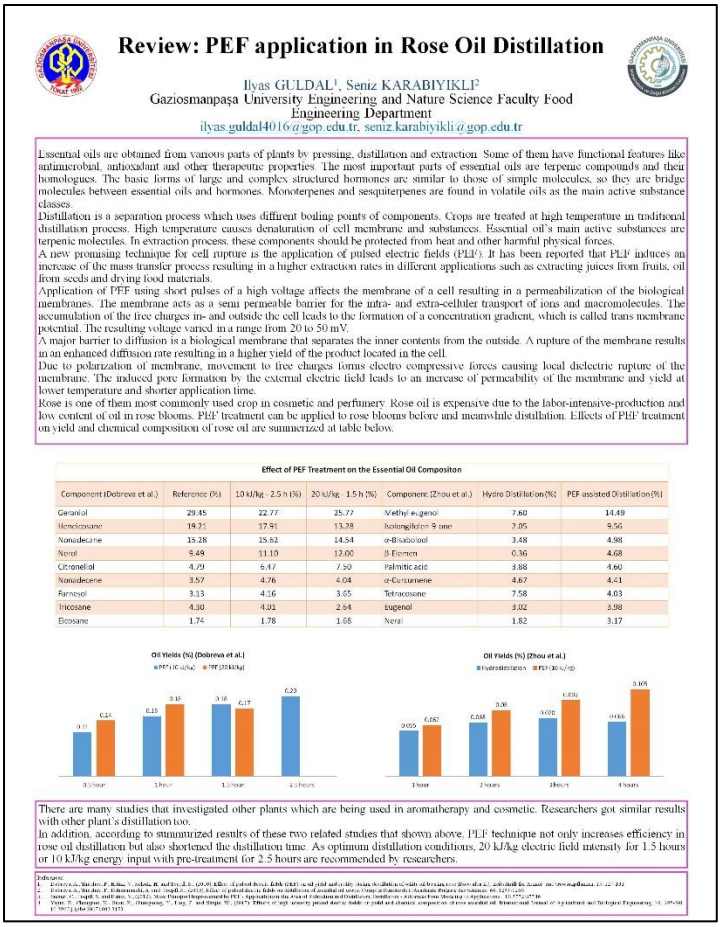

Review: PEF application in Rose Oil Distillation

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Essential oils are obtained from various parts of plants by pressing, distillation and extraction. Some of them have functional features like antimicrobial, antioxidant and other therapeutic properties. The most important parts of essential oils are terpenic compounds and their homologues. The basic forms of large and complex structured hormones are similar to those of simple molecules, so they are bridge molecules between essential oils and hormones. Monoterpenes and sesquiterpenes are found in volatile oils as the main active substance classes.
Distillation is a separation process which uses diffirent boiling points of components. Crops are treated at high temperature in traditional distillation process. High temperature causes denaturation of cell membrane and substances. Essential oil's main active substances are terpenic molecules. In extraction process, these components should be protected from heat and other harmful physical forces.
A new promising technique for cell rupture is the application of pulsed electric fields (PEF). It has been reported that PEF induces an increase of the mass transfer process resulting in a higher extraction rates in different applications such as extracting juices from fruits, oil from seeds and drying food materials.
Application of PEF using short pulses of a high voltage affects the membrane of a cell resulting in a permeabilization of the biological membranes. The membrane acts as a semi permeable barrier for the intra- and extra-celluler transport of ions and macromolecules. The accumulation of the free charges in- and outside the cell leads to the formation of a concentration gradient, which is called trans membrane potential. The resulting voltage varied in a range from 20 to 50 mV.
A major barrier to diffusion is a biological membrane that separates the inner contents from the outside. A rupture of the membrane results in an enhanced diffusion rate resulting in a higher yield of the product located in the cell.
Due to polarization of membranc, movement to free charges forms electro compressive forces causing local dielectric rupture of the membrane. The induced pore formation by the external electric field leads to an increase of permeability of the membrane and yield at lower temperature and shorter application time.
Rose is one of them most commonly used crop in cosmetic and perfumery. Rose oil is expensive due to the labor-intensive-production and low content of oil in rose blooms. PEF treatment can be applied to rose blooms before and meanwhile distillation. Effects of PEF treatment on yield and chemical composition of rose oil are summerized at table below.

Effect of PEF Treatment on the Essential Oil Compositon

Component (Dobreva et al.)	Reference (%)	10 kJ/kg - 2.5 h (%)	20 kJ/kg - 1.5 h (%)	Component (Zhou et al.)	Hydro Distillation (%)	PEF-assisted Distillation (%)
Geraniol	29.45	22.77	25.77	Methyl eugenol	7.60	14.49
Heneicosane	19.71	17.91	13.78	Isoiongilolen-9 one	7.05	9.56
Nonadecane	15.28	15.82	14.54	α-Eudesmol	3.48	4.98
Nerol	9.49	11.10	12.00	β-Elemen	0.36	4.68
Citronellol	4.79	6.47	7.30	Palmitic acid	3.88	4.60
Nonadecene	3.57	4.76	4.04	α-Curcumene	4.67	4.41
Farnesol	3.13	4.16	3.65	Tetracosane	7.58	4.03
Tricosane	4.30	4.01	2.64	Eugenol	3.02	3.98
Eicosane	1.74	1.78	1.68	Nerol	1.82	3.17

There are many studies that investigated other plants which are being used in aromatherapy and cosmetic. Researchers got similar results with other plant's distillation too.
In addition, according to summarized results of these two related studies that shown above, PEF technique not only increases efficiency in rose oil distillation but also shortened the distillation time. As optimum distillation conditions, 20 kJ/kg electric field intensity for 1.5 hours or 10 kJ/kg energy input with pre-treatment for 2.5 hours are recommended by researchers.

Abstract

There are many researches which were investigated the effects of PEF application in oil distillation. In this study, the researches on PEF application in rose oil distillation were reviewed and results were concerned on the base of advantages and disadvantages of the PEF application by comparing the other methods.

Rose is one of them most commonly used crop in cosmetic. Rose oil is also used in perfumery. Rose oil is expensive due to the labor-intensive production and low content of oil in rose blooms. Extraction processes are determined by the mass transfer of target substances from inside of the cell through the cell wall.
A new promising technique for cell rupture is the application of pulsed electric fields (PEF). It has been reported that PEF induces an increase of the mass transfer process resulting in a higher extraction rates in different applications such as extracting juices from fruits, oil from seeds and drying food materials.
Application of PEF using short pulses of a high voltage affects the membrane of a cell resulting in a permeabilization of the biological membranes. The membrane acts as a semi permeable barrier for the intra- and extra-celluler transport of ions and macromolecules. The accumulation of the free charges in- and outside the cell leads to the formation of a concentration gradient, which is called trans membrane potential. The resulting voltage varied in a range from 20 to 50 mV.

Research has shown that the PEF technique not only increases efficiency in rose oil distillation but also shortened the distillation time. As optimum distillation conditions, 20 kV/cm electric field intensity for 2 hours or 10 kJ/kg energy input with pre-treatment for 1.5 hours are recommended by researchers.

Keywords:*PEF application, Rose oil distillation.*

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DETERMINATION OF CHARACTERISTICS OF INSTANT TEA PRODUCED FROM THYME (*Thymus vulgaris*)

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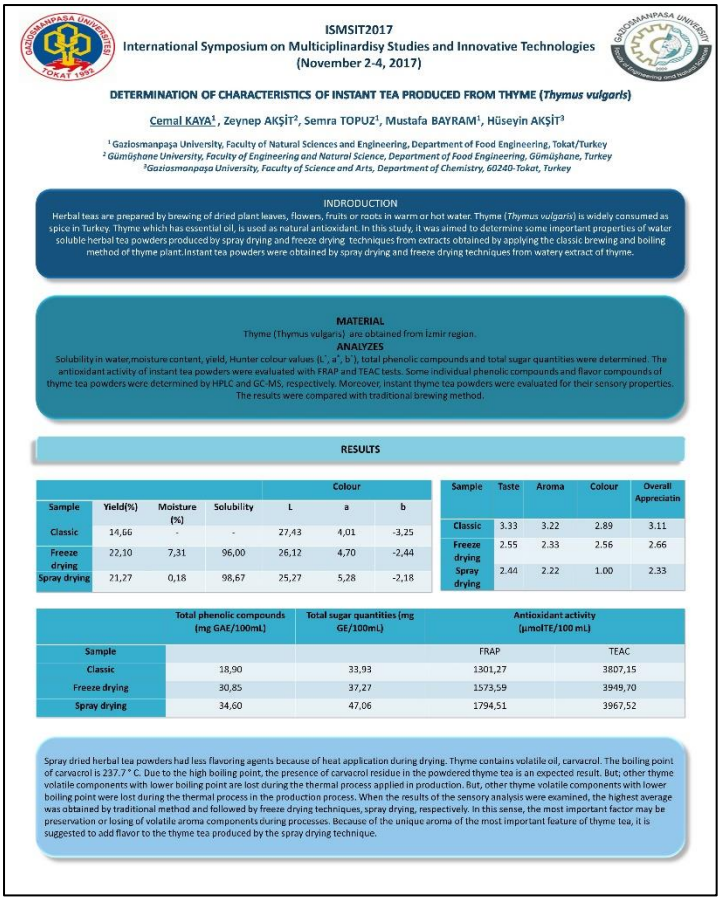

Abstract

Herbal teas are prepared by brewing of dried plant leaves, flowers, fruits or roots in warm or hot water. Thyme (*Thymus vulgaris*) is widely consumed as spice in Turkey. Thyme which has essential oil, is used as natural antioxidant. In this study, it was aimed to determine some important properties of water soluble herbal tea powders produced by spray drying and freeze drying techniques from extracts obtained by applying the classic brewing and boiling method of thyme plant.Instant tea powders were obtained by spray drying and freeze drying techniques from watery extract of thyme. Some physical and chemical properties of these tea powders were investigated. Solubility in water, moisture content, yield, Hunter colour values (L^*, a^*, b^*), total phenolic compounds and total sugar quantities were determined. The antioxidant activity of instant tea powders were evaluated with FRAP and TEAC tests. Some individual phenolic compounds and flavor compounds of thyme tea powders were determined by HPLC and GC-MS, respectively. Moreover, instant thyme tea powders were evaluated for their sensory properties. The results were compared with traditional brewing method.Solubility in water of thyme tea powders by using freeze drying and spray drying techniques were found 96,00; 98,67 and moisture content were found 7,31; 0,18%. Yield of tea powder produced from thyme plant (traditional; freeze dried; spray dried) were found 14,66; 22,10; 21,27 %. Moreover, the hunter colour values of thyme teas prepared by using traditional method, freeze dried powder, spray dried powder were 27,43; 26,12; 25,27 L^*, 4,01; 4,70; 5,28 a^*, -3,25; -2,44; -2,18 b^*. Total phenolic content of tea produced from thyme (traditional; freeze dried; spray dried) were found as 18,90; 30,85; 34,60 mgGAE/100 mL and total sugar quantities were found as 33,93; 37,27; 47,06 mgGE/100mL. FRAP activities were found as 1301,27; 1573,59; 1794,51µmolTE/100 mL and TEAC activities were found as 3807,15; 3949,70; 3967,52 µmolTE/100 mL, respectively. Spray dried herbal tea powders had less flavoring agents because of heat application during drying. Thyme contains volatile oil, carvacrol. The boiling point of carvacrol is 237.7 ° C. Due to the high boiling point, the presence of carvacrol residue in the powdered thyme tea is an expected result. But; other thyme volatile components with lower boiling point are lost during the thermal process applied in production. But, other thyme volatile components with lower boiling point were lost during the thermal process in the production process. When the results of the sensory analysis were examined, the highest average was obtained by traditional method and followed by freeze drying techniques, spray drying, respectively. In this sense, the most important factor may be preservation or losing of volatile aroma components during processes. Because of the unique aroma of the most important feature of thyme tea, it is suggested to add flavor to the thyme tea produced by the spray drying technique.

Keywords: *Thyme (Thymus vulgaris), instant tea , spray drying, freeze drying*

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A HEALTHY DRINK: BLACK TEA

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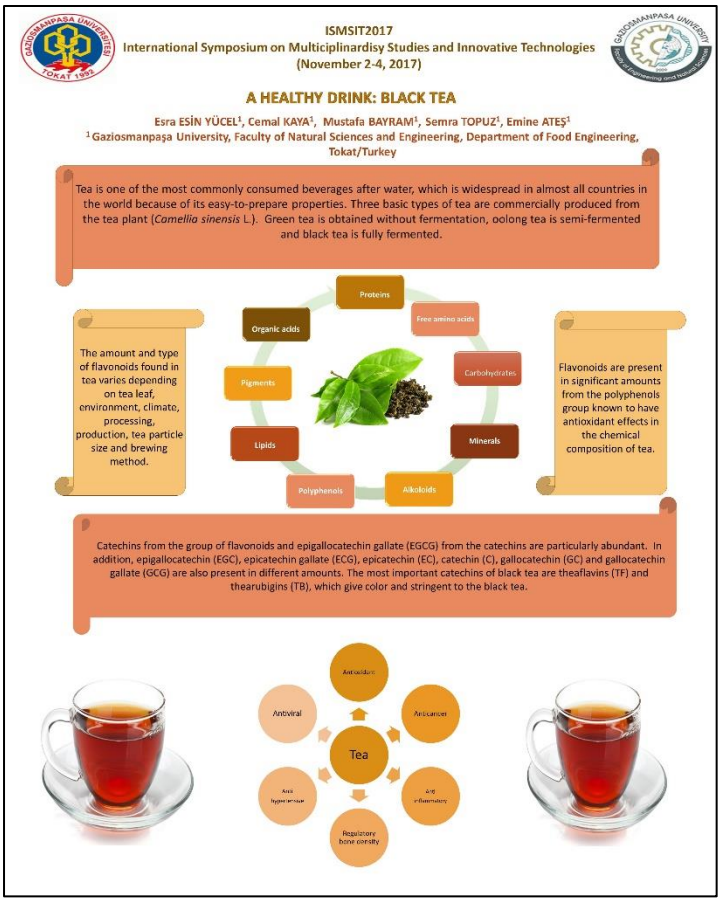

Abstract

Tea is one of the most commonly consumed beverages after water, which is widespread in almost all countries in the world because of its easy-to-prepare properties. Three basic types of tea are commercially produced from the tea plant (*Camellia sinensis* L.). Green tea is obtained without fermentation, oolong tea is semi-fermented and black tea is fully fermented.

Flavonoids are present in significant amounts from the polyphenols group known to have antioxidant effects in the chemical composition of tea varieties as well as proteins, free amino acids, carbohydrates, mineral substances, organic acids, alkaloids. Catechins from the group of flavonoids and epigallocatechin gallate (EGCG) from the catechins are particularly abundant. In addition, epigallocatechin (EGC), epicatechin gallate (ECG), epicatechin (EC), catechin (C), gallocatechin (GC) and gallocatechin gallate (GCG) are also present in different amounts. The most important catechins of black tea are theaflavins (TF) and thearubigins (TB), which give color and stringent to the black tea. The amount and type of flavonoids found in tea varies depending on tea leaf, environment, climate, processing, production, tea particle size and brewing method. Scientific studies indicate that black tea and green tea active ingredients have similar effects in protecting against diseases. Both green and black tea are described as antioxidant beverages due to their polyphenolic compounds. Tea catechins have been shown to have protective effects against chronic diseases due to their free radicals and their ability to reduce DNA damage, prevent uncontrolled cell growth, help the immune system develop, and prevent cancer cells from developing and increasing. Both green and black tea have been reported for all age groups prevention of coronary heart diseases (CHD), stroke, cardiovascular diseases (KDH), hypertension, gastric and colonic cancer types, arthritis, antiviral and antiinflammatory diseases and regulatory effects on bone density. It is also reported that the L-theanine in tea is the increasing effect of the focus, effect of renewal and revival in tea-drinking people. Despite these positive effects of tea, tea is also found to have negative effects such as reducing iron and protein absorption due to the presence of tannins, especially in the anemic people said that this effect is more. However, it is stated that more in vivo and in vitro studies are needed to obtain definite results in all study fields.

Keywords: Black tea, catechins, cancer, coronary heart diseases, phenolics

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The Effect of Transition Metal Oxides on Anatase-Rutile Phase Transformation of Titanium Dioxide

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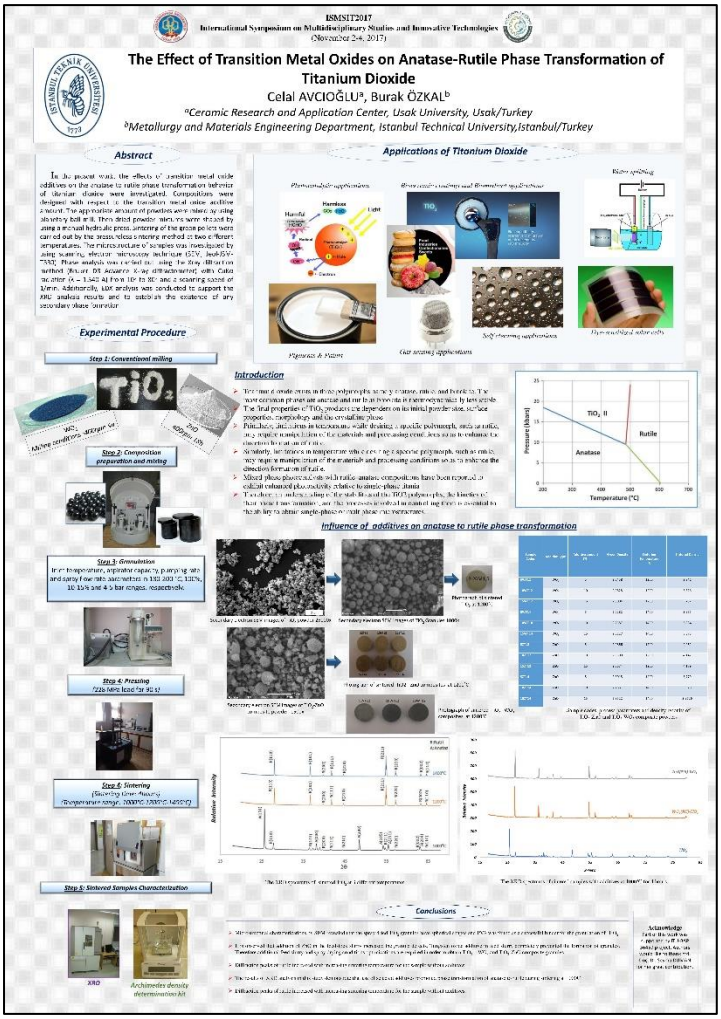

Abstract

Titanium dioxide is an attractive material due to its unique properties. It is one of the most widely used ceramic material for photocatalytic applications. Titania naturally exists in four polymorphs namely anatase, rutile, brookite, and columbite. Anatase is the low-temperature phase of TiO_2 and it transforms to rutile at elevated temperatures which do not have a certain temperature. Therefore, controlling and stabilizing these phases are a technical challenge, especially in the case of high-temperature processes and applications such as thermal spray coatings, gas separation membranes and the production of gas sensors.

In this study, the effects of transition metal oxide additives on the anatase to rutile phase transformation behavior of titanium dioxide were investigated. Compositions were designed with respect to the transition metal oxide additive amount. The appropriate amount of powders were mixed by using planetary ball mill. Then dried powder mixtures were shaped by using a manual hydraulic press. Sintering of the green pellets were carried out by the pressureless sintering method at two different temperatures. The microstructure of samples was investigated by using scanning electron microscopy technique (SEM, Jeol-JSM-T330). Phase analysis was carried out using the Xray diffraction method (Bruker D8 Advance X-ray diffractometer) with CuKα radiation (λ = 1.540 A) from 10◦ to 80◦ and a scanning speed of 1/min. Additionally, EDX analysis was conducted to support the XRD analysis results and to establish the existence of any secondary phase formation.

Particularly in the nanometer range, titanium dioxides polymorphs have very different properties and hence exhibits different photocatalytic performances. Besides that, the existence of either or both of anatase and rutile phases in the material also affects the photocatalytic performance. according to literature ionic radius and valence electrons number of transition metal oxide additives have a significant effect on the kinetics of the anatase to rutile phase transformation. The results shown that the addition of %5wt of tungsten oxide and zinc oxide enhances anatase to rutile phase transformation.

Keywords: *Anatase, Rutile, TiO_2, Phase transformation.*

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Determination of Mechanical Properties of Various Polyolefin Polymers that Applied Resistive Implant Welding Technique

Hüseyin BAKIRCI[1*], Mehmet Arif KAYA[1] and İdris KARAGÖZ[2]

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[2]*Materials and Materials Processing Department / Yalova University, Turkey*

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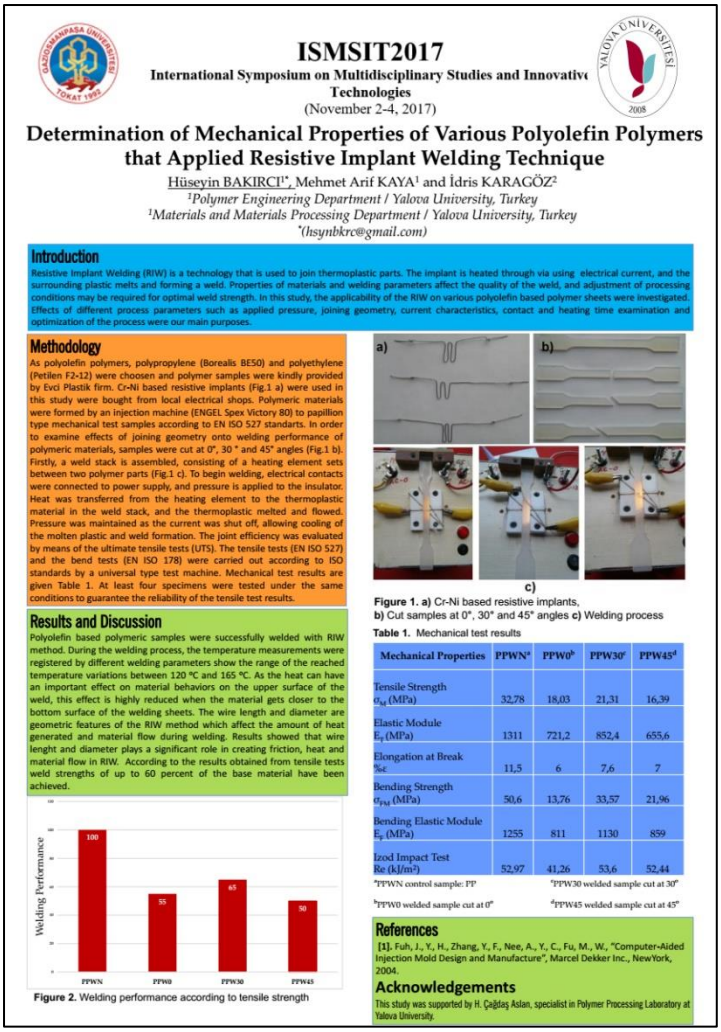

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Hüseyin BAKIRCI[1*], Mehmet Arif KAYA[1] and İdris KARAGÖZ[2]

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Introduction

Resistive Implant Welding (RIW) is a technology that is used to join thermoplastic parts. The implant is heated through via using electrical current, and the surrounding plastic melts and forming a weld. Properties of materials and welding parameters affect the quality of the weld, and adjustment of processing conditions may be required for optimal weld strength. In this study, the applicability of the RIW on various polyolefin based polymer sheets were investigated. Effects of different process parameters such as applied pressure, joining geometry, current characteristics, contact and heating time examination and optimization of the process were our main purposes.

Methodology

As polyolefin polymers, polypropylene (Borealis BE50) and polyethylene (Petilen F2-12) were choosen and polymer samples were kindly provided by Evci Plastik firm. Cr-Ni based resistive implants (Fig.1 a) were used in this study were bought from local electrical shops. Polymeric materials were formed by an injection machine (ENGEL Spex Victory 80) to papillion type mechanical test samples according to EN ISO 527 standarts. In order to examine effects of joining geometry onto welding performance of polymeric materials, samples were cut at 0°, 30 ° and 45° angles (Fig.1 b). Firstly, a weld stack is assembled, consisting of a heating element sets between two polymer parts (Fig.1 c). To begin welding, electrical contacts were connected to power supply, and pressure is applied to the insulator. Heat was transferred from the heating element to the thermoplastic material in the weld stack, and the thermoplastic melted and flowed. Pressure was maintained as the current was shut off, allowing cooling of the molten plastic and weld formation. The joint efficiency was evaluated by means of the ultimate tensile tests (UTS). The tensile tests (EN ISO 527) and the bend tests (EN ISO 178) were carried out according to ISO standards by a universal type test machine. Mechanical test results are given Table 1. At least four specimens were tested under the same conditions to guarantee the reliability of the tensile test results.

a) b) c)

Figure 1. a) Cr-Ni based resistive implants, b) Cut samples at 0°, 30° and 45° angles c) Welding process

Table 1. Mechanical test results

Mechanical Properties	PPWN[a]	PPW0[b]	PPW30[c]	PPW45[d]
Tensile Strength σ_M (MPa)	32,78	18,03	21,31	16,39
Elastic Module E_t (MPa)	1311	721,2	852,4	655,6
Elongation at Break %ε	11,5	6	7,6	7
Bending Strength σ_{fM} (MPa)	50,6	13,76	33,57	21,96
Bending Elastic Module E_f (MPa)	1255	811	1130	859
Izod Impact Test Re (kJ/m²)	52,97	41,26	53,6	52,44

[a]PPWN control sample: PP [c]PPW30 welded sample cut at 30°

[b]PPW0 welded sample cut at 0° [d]PPW45 welded sample cut at 45°

Results and Discussion

Polyolefin based polymeric samples were successfully welded with RIW method. During the welding process, the temperature measurements were registered by different welding parameters show the range of the reached temperature variations between 120 °C and 165 °C. As the heat can have an important effect on material behaviors on the upper surface of the weld, this effect is highly reduced when the material gets closer to the bottom surface of the welding sheets. The wire length and diameter are geometric features of the RIW method which affect the amount of heat generated and material flow during welding. Results showed that wire lenght and diameter plays a significant role in creating friction, heat and material flow in RIW. According to the results obtained from tensile tests weld strengths of up to 60 percent of the base material have been achieved.

Figure 2. Welding performance according to tensile strength

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Acknowledgements

This study was supported by H. Çağdaş Aslan, specialist in Polymer Processing Laboratory at Yalova University.

Abstract

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Polyolefin based polymer parts were successfully welded with RIW method. During the welding process, the temperature measurements were registered by different welding parameters show the range of the reached temperature variations between 120 °C and 165 °C. As the heat can have an important effect on material behaviors on the upper surface of the weld, this effect is highly reduced when the material gets closer to the bottom surface of the welding sheets. The wire length and diameter are geometric features of the RIW method which affect the amount of heat generated and material flow during welding. Results showed that wire lenght and diameter plays a significant role in creating friction, heat and material flow in RIW. According to the results obtained from tensile tests weld strengths of up to 60 percent of the base material have been achieved.

Keywords: *Polyolefins, welding of plastics, mechanical properties , Resistive Implant Welding (RIW)*

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Recycling of Carpets to Polymeric Raw Materials

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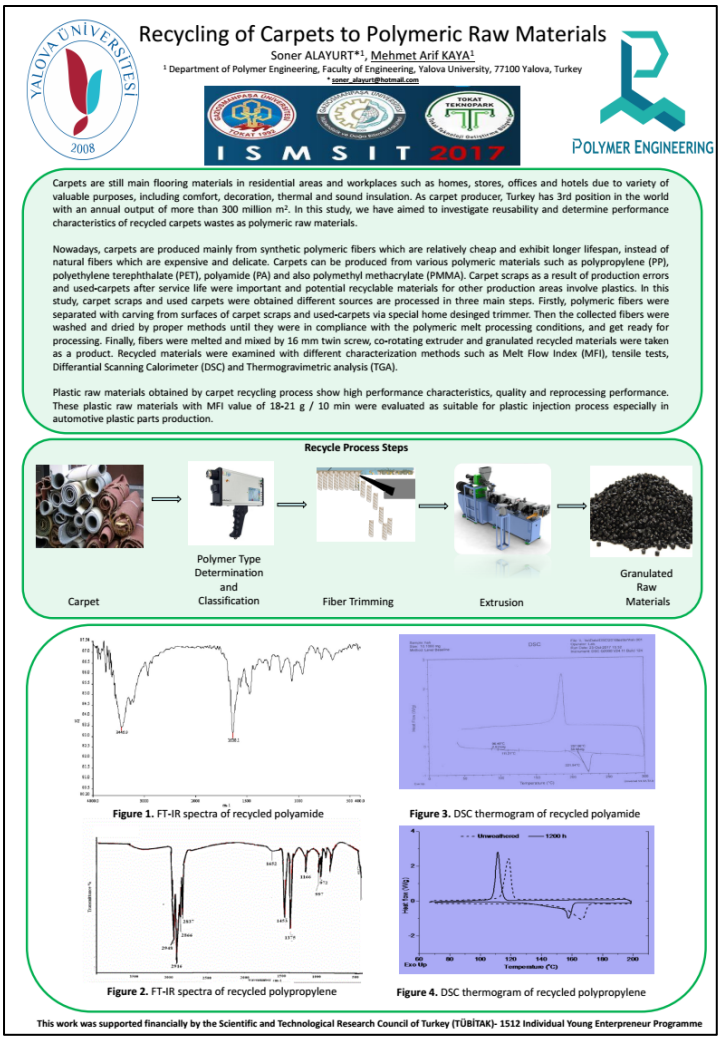

Abstract

Carpets are still main flooring materials in residential areas and workplaces such as homes, stores, offices and hotels due to variety of valuable purposes, including comfort, decoration, thermal and sound insulation. As carpet producer, Turkey has 3rd position in the world with an annual output of more than 300 million m^2. In this study, we have aimed to investigate reusability and determine performance characteristics of recycled carpets wastes as polymeric raw materials.

Nowadays, carpets are produced mainly from synthetic polymeric fibers which are relatively cheap and exhibit longer lifespan, instead of natural fibers which are expensive and delicate. Carpets can be produced from various polymeric materials such as polypropylene (PP), polyethylene terephthalate (PET), polyamide (PA) and also polymethyl methacrylate (PMMA). Carpet scraps as a result of production errors and used-carpets after service life were important and potential recyclable materials for other production areas involve plastics. In this study, carpet scraps and used carpets were obtained different sources are processed in three main steps. Firstly, polymeric fibers were separated with carving from surfaces of carpet scraps and used-carpets via special home desinged trimmer. Then the collected fibers were washed and dried by proper methods until they were in compliance with the polymeric melt processing conditions, and get ready for processing. Finally, fibers were melted and mixed by 16 mm twin screw, co-rotating extruder and granulated recycled materials were taken as a product. Recycled materials were examined with different characterization methods such as Melt Flow Index (MFI), tensile tests, Differantial Scanning Calorimeter (DSC) and Thermogravimetric analysis (TGA).

Plastic raw materials obtained by carpet recycling process show high performance characteristics, quality and reprocessing performance. These plastic raw materials with MFI value of 18-21 g / 10 min were evaluated as suitable for plastic injection process especially in automotive plastic parts production.

Keywords: *carpet, recycling, polypropylene, polyethylene terephthalate, polyamide, polymethyl methacrylate*

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Tightly Regulated Expression, Purification and Analysis of Recombinant Red Fluorescent Protein (TagRFP675)

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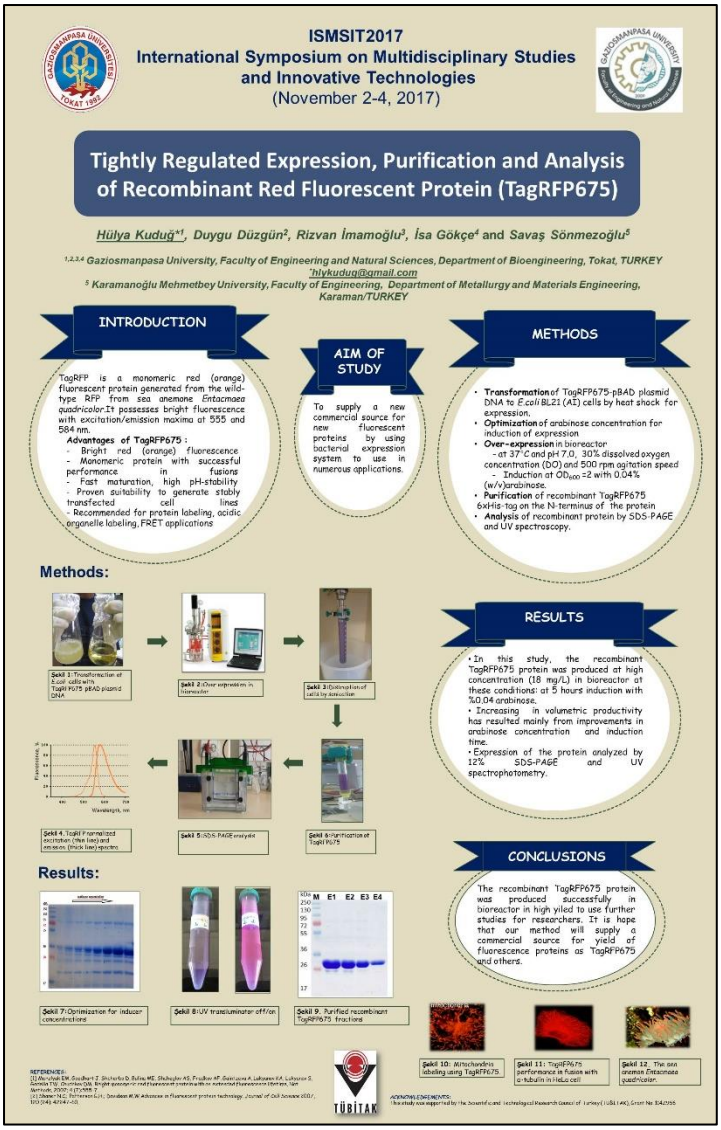

Abstract

TagRFP675 is a monomeric red (orange) fluorescent protein generated from the wild-type RFP from sea anemone *Entacmaea quadricolor* [Merzlyak *et al.*, 2007]. It possesses bright fluorescence with excitation/emission maxima at 555 and 584 nm, respectively. TagRFP is about three times brighter than mCherry protein [Shaner *et al.*, 2004], which makes it the brightest monomeric red fluorescent protein available so far. TagRFP is mainly intended for protein labeling and FRET applications. It can also be used for cell and organelle labeling and for tracking the promoter activity. Aim of this study is production of TagRFP675 in a large scale in *E.coli* expression system using bioreactor for further biological applications.

E.coli pBAD expression vector is a tighly regulated system allows to turn expression on/off by dose-dependent to modulate expression level. In this work, recombinant plasmid contruct pBAD-TagRFP675 transformed. to *E.coli* BL21-AI competent cells for expression by heat shock. TagRFP675 expression was optimized by fine adjustments such as induction time and inducer concentration. Arabinose was used as inducer at %0.002-0.04 concentration. The optimum arabinose concentration decided by SDS-PAGE analysis. *E.coli* cells were grown in 3L Luria-Bertani (LB)-Amp medium in bioreactor. Temperature at 37°C and pH at 7.0 were controlled. The dissolved oxygen concentration (DO) was maintained at 30% saturation by increasing agitation and O_2-enrichment if required. Induction for protein expression for 5 hours at optimum inducer concentration. After induction period cells were harvested by cenrifugation. Cell pellets resuspended in lysis buffer anad distrupted by sonification. The lysate was centrifugated and supernetant transferred to afinity chromatography column for purification of recombinant protein. The protein is engineered with 6xHis-tag on the N-terminus, which can be used for purification/removal by using Ni++ beads easily. Recombinant protein analyzed SDS-PAGE and UV spectroscopy.

The TagRFP675 protein was expressed in *E. coli* as a His-tagged protein. Approximately 28 kDa (245 amino acids) fusion protein analyzed by SDS-PAGE as expected. Purified TagRFP675 was determined by spectrofotometri . Results show that arabinose concentration significantly affected protein yields. It is observed that at optimized arabinose concentration (0.04 %) for 5 hours induction resulted high levels of fluorescent protein expression. Productivity of bacterial cells cultivated in bioreactors has reached the 18 gram per liter in highest performance at given conditions. The protein is engineered with 6xHis-tag on the N-terminus purified by using Ni++ beads in affinity column. The method we used supplies a quick, high-yield production and can be used to produce any fluorescent protein that is needed in biomedical research especially bioimaging. Results show that pBAD vectors allows to maximize recombinant protein yields unless insoluble forms of protein.

Keywords: *red fluorescent protein, TagRFP675, E.coli, recombinant protein*

This study was supported by the Scientific and Technological Research Council of Turkey (TUBITAK Grant Number 114Z956) who provided financial support for this research.

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Spin Coating of Dy/Al of Doped Zn Films Prepared By Sol-Gel Method

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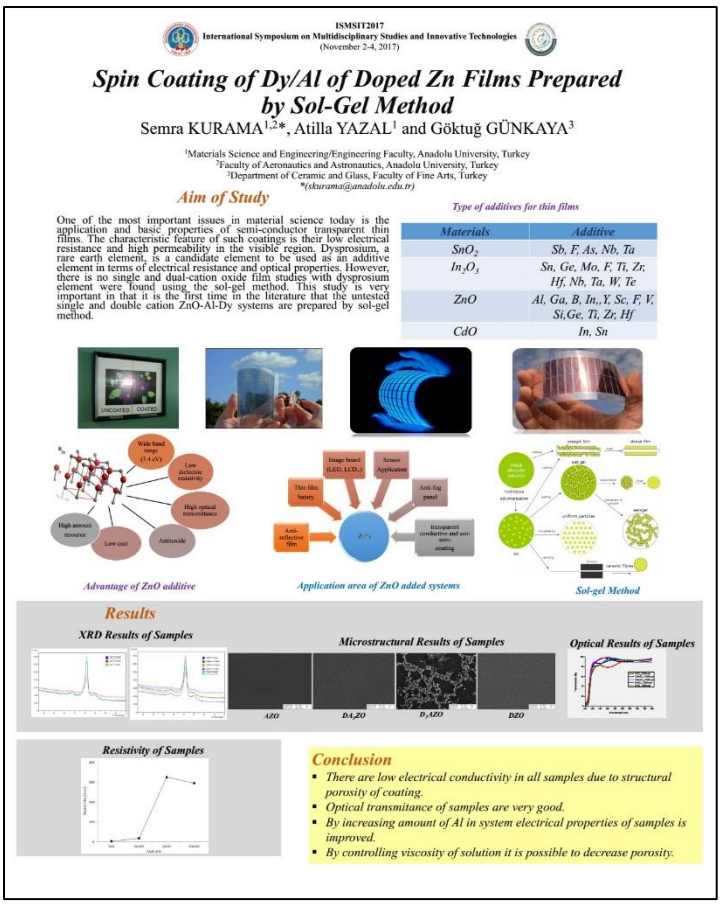

Abstract

One of the most important issues in material science today is the application and basic properties of semi-conductor transparent thin films. The characteristic feature of such coatings is their low electrical resistance and high permeability in the visible region. Dysprosium, a rare earth element, is a candidate element to be used as an additive element in terms of electrical resistance and optical properties. However, there is no single and dual-cation oxide film studies with dysprosium element were found using the sol-gel method. This study is very important in that it is the first time in the literature that the untested single and double cation ZnO-Al-Dy systems are prepared by sol-gel method.

In this study, Al, Dy: ZnO (DAZO) films were deposited on glass substrates by a spin coating technique. Zinc precursor was solved in a solvent, which has different amounts of Al and Dy dopants, to obtain desired doping concentration, and monoethyl amine (MAE), to stabilize the soles, added to solutions. The prepared solutions were mixed with a magnetic stirrer and waited over 24 hours. The solutions were used to coat cleaned borosilicate glass substrates by spin coating method. Each film was coated ten times onto glass substrates and dried at 300°C for 10 minutes after each coating. Obtained films were sintered at 500°C and for 2 hours. The X-Ray Diffraction (XRD), photospectroscopy Scanning electron microscopy (SEM) and electrometer used to examine the microstructure, optical and electrical properties of the films.

In this study, a thin film was formed by coating the ZnO composition of Al and Dy added by the sol-gel method with a rotary coater. The structural, optical and electrical properties of these films have been investigated. It was understood that the films were crystallized in the plane of Al, Dy: ZnO thin film (002), which is formed by x-ray diffraction patterns, the structure as hexagonal and the optimum rotation speed is 1000 rpm. SEM images were examined and information about surface morphology was obtained. The film surfaces were found to be highly porous and it was thought that the low electrical conductivity was related to the film pore quantity. The homogeneity of the coated DAZO sample at a rotational speed of 1000 rpm affected the optical properties of film in the negative direction. This is related to the non-homogeneous film surface and the fact that the process of cleaning the borosilicate glass surface where the film was coated could not be precisely performed. In addition, the optical properties of AZO, D3AZO, DA3ZO and DZO samples showed very good performance with a transmittance value above 90% with Al^{+3}, Dy^{+3} Zn^{+2} exchange. In thin films, as the amount of Al increases and accordingly the amount of Dy decreases, the result is that the electrical conductivity increases.

Keywords: *semi conductor, spin coating, DAZO film*

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Atıksu Arıtma Tesisi Çıkış Suyu Kalitesini İyileştirmek İçin Biyoteknolojik Bir Uygulama

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Özet – Bu çalışmanın amacı, biyoteknolojik uygulamada kullanılan fitoremediasyon tekniği ile Elazığ Belediyesi Atıksu Arıtma Tesisi çıkış sularının kalitesini iyileştirmektir. Bu amaçla, Elazığ Belediyesi Atıksu Arıtma Tesisi çıkış sularının verileceği bir reaktör tasarımı gerçekleştirildi. Reaktörün tasarımında arıtma tesisi son çökeltme havuzunun boyutları esas alındı. Reaktörün çapı yaklaşık 41 cm, su yüksekliği 3 cm olacak şekilde boyutlandırıldı. Reaktör yapıldıktan sonra Elazığ Belediyesi Atıksu Arıtma Tesisi son çökeltme havuzu çıkış sularının verildiği noktaya reaktör yerleştirildi. Çalışmada kullanılan sucul bitkilerden Lemna gibba L. bitkisi Elazığ yöresinden doğal ortamdan toplandı. Doğal ortamdan toplanan Lemna gibba L. bitkisi tasarlamış olduğumuz reaktörün yüzeyini kaplayacak şekilde yerleştirildi ve çalışmalara başlanıldı. Atıksu arıtma tesisi çıkış suyu parametrelerinden olan AKM, BOİ5, KOİ, O-PO4-3 ve NH4+-N konsantrasyonları tespit edildi. Arıtma tesisi çıkış suyunun verildiği bitkili reaktörün çıkışında söz konusu parametrelerin konsantrasyonlarında bir azalma olduğu görüldü. Sonuç olarak uygulamış olduğumuz fitoremediasyon tekniğinin arıtma tesisi çıkış suyu kalitesini iyileştirdiği belirlendi.

Anahtar kelimeler *– Arıtma, fitoremediasyon, reaktör, Lemna gibba L.*

A Biotechnological Application to Improve the Effluent Quality of Wastewater Treatment Plant

Abstract – The aim of this study is to improve the quality of the effluent of Elazığ Municipal Wastewater Treatment Plant with the technique of phytoremediation used in a biotechnological application. For this purpose, a reactor design which the effluent of Elazığ Municipal Wastewater Treatment Plant fed was realized. In the design of the reactor, the size of the final settling basin of the treatment plant was taken as basis. The size of the reactor was about 41 cm in diameter and 3 cm in water height. After the reactor was built, the reactor was placed at the point where the final settling basin effluent of Elazığ Municipal Wastewater Treatment Plant was discharged. Lemna gibba L. plant that used in the study was collected from natural environment from Elazığ region. Lemna gibba L. plant collected from the natural environment was placed in such a way as to cover the surface of the reactor we had designed and work started. Concentrations of SS, BOD5, COD, O-PO4-3 and NH4+-N, which are the effluent parameters of the wastewater treatment plant, were determined. At the exit of the planted reactor where the treatment plant effluent was fed, it was seen that there was a decrease in the concentrations of the said parameters. As a result, it was determined that the phytoremediation technique we applied improved the quality of the effluent from the treatment plant.

Keywords – *Treatment, phytoremediation, reactor, Lemna gibba L.*

I. GİRİŞ

Çeşitli faaliyetler sonucu kullanılan sular kanalizasyon sistemleri vasıtasıyla ya doğrudan alıcı ortama verilmekte ya da atıksu arıtma tesislerine gelerek belirli düzeyde arıtılmaktadır. Ülkemizde evsel/kentsel atıksu arıtma tesisleri incelendiğinde birçoğunun klasik atıksu arıtma tesisinden oluştuğu görülmektedir. Kentsel atıksu arıtma tesisi çıkış suları incelendiğinde atıksu içerisinde birçok kirleticilerin bulunduğu pek çok araştırmacı tarafından tespit edilmiştir. Bu kirleticiler arasında ağır metaller, azotlu ve fosforlu bileşiklerin yanısıra pestisit kalıntıları, antibiyotik kalıntıları ve endokrin bozucu maddeler vs. gibi birçok mikrokirleticiler de bulunmaktadır. Klasik atıksu arıtma tesisleri söz konusu kirleticilerin

giderilmesinde yeterli olmamakta ve kirleticilerin belirli konsantrasyonları alıcı ortamlara verilmektedir. Bu durum, alıcı ortamlarda birçok çevresel problemi beraberinde getirmektedir. Bu nedenle, atıksuların arıtılmasında ileri arıtım teknolojileri kullanılmaktadır. İleri atıksu arıtımında, adsorpsiyon, membran sistemleri gibi teknolojiler kullanılmakla beraber biyoteknolojik bir yöntem olan fitoremediasyon gibi sucul bitkilerle arıtım teknolojileri de kullanılmaktadır. Bu teknolojilerin kullanılmasıyla atıksu arıtma tesisinden çıkan suların kalitesi iyileştirilebilir ve suyun tekrar kullanılması (örneğin sulama suyu gibi) sağlanabilir.

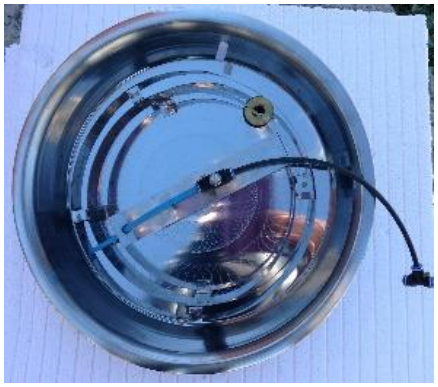
Fitoremediasyon, atıksulardan kirleticileri absorbe etmek için bitkilerin doğal yeteneğinin kullanılmasıdır ve fitoremediasyon düşük maliyetli ve çevre dostu olarak bilinen bir remediasyon tekniğidir [1], [2]. Bu nedenle, atıksuların arıtılması için çevre dostu ve verimli teknolojilerin geliştirilmesi önemli araştırma alanlarından biridir. Bu amaçla, fitoremediasyon atıksularda bulunan kirleticilerin giderilmesi için uygun bir metot olarak göz önünde bulundurulur ve iyi bir yeşil remediasyon teknolojisi olarakta tanımlanabilir [3].

Fitoremediasyonda yüzen, batık ve köklü bitkiler kullanılabilir. Bu çalışmada, yüzen bitkilerden *Lemna gibba* L. bitkisi (su mercimeği) kullanılmıştır. *Lemna gibba* L. bitkisi, *Lemnaceae* ailesine ait çok küçük, yüzebilen sucul bir makrofittir [4-6]. *Lemna gibba* L. atıksu arıtımında kirleticileri gidermek amacıyla yaygın bir şekilde kullanılmaktadır.

Bu çerçevede, çalışmamızda biyoteknolojik bir uygulama olan fitoremediasyon tekniği kullanılarak reaktör tasarımı gerçekleştirilmiş ve arıtma tesisine entegre edilen bitkili reaktörün çıkış suyu kalitesinde bir iyileşme olup olmadığı belirlenmiştir.

II. Materyal ve Metot

Bu çalışmada kullanılan reaktör Elazığ Belediyesi Atıksu Arıtma Tesisi son çökeltme havuzu tasarım parametreleri esas alınarak tasarlandı. Reaktörün çapı yaklaşık 41 cm olacak şekilde, su yüksekliği ise 3 cm olacak şekilde boyutlandırma işlemi gerçekleştirildi. Reaktöre yerleştirilecek olan sucul bitkilerin (*Lemna gibba* L.) reaktörden kaçmasını engellemek amacıyla reaktörün içine daha küçük çapta dairesel bir bölme yapıldı. Atıksu arıtma tesisi çıkış suyunu reaktöre belirli bir debide vermek amacıyla reaktörün üst kısmına ayarlanabilir bir vana yerleştirildi. Reaktörün şekli Şekil 1'de gösterilmiştir.



Şekil 1. Reaktör

Reaktör yapıldıktan sonra Elazığ Belediyesi Atıksu Arıtma Tesisi son çökeltme havuzu çıkış sularının verildiği noktaya reaktör yerleştirildi. Pompa yardımıyla atıksu arıtma tesisi çıkış suyu reaktöre verildi. Çalışmada materyal olarak kullanılan sucul bitkilerden *Lemna gibba* L. bitkisi Elazığ yöresinden doğal ortamdan toplandı. Doğal ortamından toplanan *Lemna gibba* L. bitkisine ait görünüm Şekil 2'de gösterilmiştir.

Şekil 2. Doğal ortamında bulunan *Lemna gibba* L.

Doğal ortamdan toplanan *Lemna gibba* L. bitkisi tasarlamış olduğumuz reaktörün yüzeyini kaplayacak şekilde yerleştirildi ve çalışmalar gerçekleştirildi. Bitkili reaktöre ait fotoğraf Şekil 3'te gösterilmiştir.

Şekil 3. Bitkili reaktör

Atıksu arıtma tesisi çıkış suyu parametrelerinden Askıda Katı Madde (AKM) Standart Metotlara göre [7], Biyokimyasal Oksijen İhtiyacı ($BOİ_5$) ve Kimyasal Oksijen İhtiyacı (KOİ) spektrofotometrik olarak Hach Lange DR3800 model spektrofotometre cihazı kullanılarak, $O\text{-}PO_4^{-3}$ ve NH_4^+-N konsantrasyonları ise Nova60 spektrofotometre cihazı kullanılarak tespit edildi.

III. Sonuçlar ve Tartışma

Atıksu arıtma tesisi çıkış sularının alıcı ortamlara deşarj edilmesi için ülkemizde deşarj standartları kullanılmaktadır. 31.12.2004 Tarih ve 25687 Sayılı Resmi Gazete'de yayınlanan Su Kirliliği Kontrolü Yönetmeliği Tablo 21'de evsel nitelikli atıksuların alıcı ortama deşarj standartları verilmiştir [8]. Tablo 21'de kirlilik yüklerine göre sınıflandırma yapılmış ve atıksu arıtma tesisi çıkış sularında $BOİ_5$, KOİ, AKM konsantrasyonları ile pH değerinin hangi değerleri aşmaması gerektiği belirtilmiştir. Elazığ Belediyesi Atıksu Arıtma Tesisi çıkış suyu

kalitesinde herhangi bir iyileşme olup olmadığı tasarlamış olduğumuz bitkili reaktörle değerlendirildi. Çalışmamızda, Elazığ Belediyesi Atıksu Arıtma Tesisi çıkış suyunda ve bitkili reaktörün çıkış suyunda AKM, $BOİ_5$, KOİ, $O\text{-}PO_4^{-3}$ ve NH_4^+-N konsantrasyonları tespit edildi. Elde edilen sonuçlara göre Elazığ Belediyesi Atıksu Arıtma Tesisi çıkış suyu bitkili reaktöre verildiğinde çıkış suyunda AKM konsantrasyonu açısından giderim veriminde %20,4 oranında bir iyileşme olduğu, $BOİ_5$ konsantrasyonu açısından giderim veriminde %55,2 oranında bir iyileşme olduğu, KOİ konsantrasyonu açısından giderim veriminde %48,9 oranında bir iyileşme olduğu, NH_4^+-N konsantrasyonu açısından giderim veriminde %6,2 oranında bir iyileşme olduğu ve $O\text{-}PO_4^{-3}$ konsantrasyonu açısından giderim veriminde %21,3 oranında bir iyileşme olduğu belirlendi. Sonuç olarak, atıksu arıtma tesisi çıkış suyuna biyoteknolojik bir uygulamayla giderim verimleri büyükten küçüğe doğru $BOİ_5$>KOİ> $O\text{-}PO_4^{-3}$>AKM> $O\text{-}PO_4^{-3}$ ve NH_4^+-N olarak tespit edildi.

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Evaluation of Recovery of Aquatic Plants Used in Wastewater Treatment and Discharged as Waste

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Abstract – In this study, the evaluation of the recovery of aquatic plants used in wastewater treatment and and discharged as waste is discussed. There are studies in the literature about the removal of pollutants from wastewaters by using different treatment methods in wastewater treatment. Many treatment methods are used in wastewater treatment as biological processes, chemical treatment, membrane systems and so on. However, such treatment methods are not preferred because of high energy costs and high operating costs, which can not be applied to all kinds of water bodies. Therefore, natural treatment systems, which do not require much human power, can be applied to almost any kind of water mass with low operating costs and energy costs, can be used for the disposal of pollutants. In natural treatment systems, treatment with aquatic plants is generally used. Because, treatment with aquatic plants are quite economical when compared with other advanced treatment methods. Harvested plants can be evaluated in biogas production and bioethanol production as an alternative fuel. In addition, harvested aquatic plants can be used in biopetrol and biochar production by subjecting to pyrolysis treatment, thus recovering of the discharged wastes can be ensured.

Keywords – Aquatic plant, treatment, waste, recovery

IV. INTRODUCTION

Constructed wetland (CW) technology was developed in 1970s as an alternative ecological technology for wastewater treatment [1]. CW technology possess several advantages compared with conventional wastewater treatment plants, such as low investment, maintenance and operation cost, utilization of renewable energy sources (wind and solar energy), and tolerance over variation of wastewater volume and level [2], [3]. CWs have been applied for the treatment of industrial, municipal and aquaculture wastewaters, polluted surface water and groundwater, landfill leachate and storm water runoff [4-12] (Fig.1).

Fig.1. Aquatic plants in wastewater treatment

CWs can remove numerous types of pollutants [12], [13]. In CWs at the same time that pollutant removal from wastewater occurs, great quantities of biomass are produced which would be available for different uses. Proper methods of biomass disposal and/or utilisation are required [14]. If they are not utilized immediately large amount of aquatic plant residues as biomass would decompose and decay. Then, this status can result in secondary pollution to water systems [15]. Different solutions have been proposed. Biomass can be transformed into raw material for the paper industry, fertilizers, compost or as a feed supplement for animals [16], [17]; and for fuel production [14].

V. DIFFERENT WAYS OF USING BIOMASS

Aquatic plants can be used for different purposes after harvesting. The uses include animal fodder, energy sector (i.e. biofuel, bioethanol, combustion), cellulosic derived bioproducts, construction of building materials and plant fiber/plastic composites, paper industry and biosourced biochemistry such as production of γ-valerolactone, Cu-ecocatalyst, potential fertilizers (compost, biochar, litter) [18-22].

The type of pollutants removed by the plants will be a crucial factor for the utilization of the biomass after harvest. In case of treating wastewater from animal farms, the plant biomass can be safely utilized as animal fodder. However, if hazardous pollutants are removed from the water and taken up by the plant, the biomass can not be safely used as animal fodder, but only for bioenergy production [23].

Since the European Union has established the European Directive 2009/28/EC to increase the production of renewable energy sources and the biofuel proportion by at least 10% in each Member State by 2020 [24], processing of aquatic plants produced by phytotechnologies may be a suitable option [18], [22]. Aquatic plants provide a promising source of clean energy due to their high biomass yield and neutral CO_2 balance [14]. *Arundo donax* L. plant used in CWs displays many attractive characteristics for producing biomass [19]. It can be used for

bioethanol production, direct combustion and other thermal transformations [22], [25-27]. Ciria et al. [14] studied the suitability of the macrophyte cattail (*Typha latifolia*) produced in a wetland as a fuel. *Typha latifolia* has high biomass yields (2·8 kg m^{-2} of dry matter, which is equivalent to 28 t ha^{-1} of dry matter). As a result, due to the high biomass yields obtained in the planted bed, and to the thermal behaviour of both cattail biomass and their ash (with a relatively high heating value of 19·6 MJ kg^{-1}), the utilisation of cattail biomass as fuel in thermochemical conversion processes for the production of heat and/or electricity was recommended by Ciria et al. [14]. Pincam et al. [23] reported that Hybrid Napier grass (Pennisetum purpureum Schumach × *P. americanum* (L.) Leeke cv. Pakchong1) has the potential to be used in plant-based water treatment systems for removing contaminants from different types of polluted water while simultaneously producing qualified large amounts of plant biomass which has ease of propagation and harvesting for further utilization as e.g. bioenergy [23]. The plant has been considered as a suitable alternative lignocellulosic feedstock for biofuel production due to its high biomass production and high proportions of cellulose, hemicellulose, and lignin [28]. Hybrid Napier grass has been reported to produce 17.9 tons bioethanol $ha^{-1}year^{-1}$. Moreover, the biogas production potential is reported to be high, ranging from 0.24–0.27 m^3 CH_4kg^{-1} VS, depending on the digestive conditions and co-digestion materials [23], [28-30]. Jiang et al. [15] investigated the biogas production potential of aquatic plants. They reported the biogas yields of 7 species of aquatic plants as follows: *Typha orientalis Presl* 513.2 mL g^{-1} VS, *Hydrocotyle vulgaris* 539.1 mL g^{-1} VS, *Thalia dealbata* 578.0 mL g^{-1} VS, *Acorus calamus Linn* 508.9 mL g^{-1} VS, *Canna indica* 555.1 mL g^{-1} VS, *Colocasia tonoimo Nakai* 629.4 mL g^{-1} VS and *Pontederia cordata* 473.1 mL g^{-1} VS.

Harvested aquatic plants could be used for paper pulp production and construction of wooden build materials. Giant reed shoots could substitute hardwoods suitable in kraft pulp mills processing chain without major equipment changes [22], [31]. *Arundo donax* L. plant meets requirements for paper pulp production and construction of wooden build materials [19], [22], [32].

In CWs, *Arundo donax* L. plant removes contaminants such as trace elements mainly by immobilization in the rhizosphere and storage in the belowground biomass [33]. Based on this property, its use to rhizofiltrate Cu-contaminated effluents could provide both a belowground biomass with high Cu concentration. The Cu-rich belowground biomass may be used in biosourced (bio)chemistry as Cu-ecocatalyst [34]. Ecocatalysis is based on the plant ability to produce plant-borne metal species usable as key reactants to catalyze fine organic chemical reaction for the production of biorenewable transportation fuels, industrial chemicals and pharmaceuticals. Copper-based catalysts are promising candidates, as they are sustainable and cost-competitive catalyzers for the high yield production of next-generation biorefinery components [22], [35].

Composting is a natural way of recycling. It turns on organic materials into a farm resource enhancing soil fertility and soil quality that brings about increased agricultural productivity, improved soil biodiversity, reduced ecological risks and a better environment. Composting organic residues is a friendly to the environment alternative to producing fertilizer [36]. Therefore, harvested biomass of aquatic plants can be composted and then spreaded on farmland.

VI. CONCLUSIONS

In the recent years, CWs have been gaining in popularity. Because CW technology is both a reduced cost technology and low maintenance technology for treating wastewater from different activities. Therefore, CW technology has been successfully applied to the treatment of various wastewaters (domestic, industrial, leachate, storm water runoff). After the wastewater treatment, large volumes of aquatic biomass are produced. The biomass harvested from the CWs can be used in different ways (paper pulp production, to get energy etc.). These routes of use will protect the natural resources.

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MOLECULAR CHARACTERIZATION OF ANTIMICROBIAL RESISTANCE AND VIRULENCE GENES OF *E. COLI* ISOLATES ISOLATED FROM CHEESE

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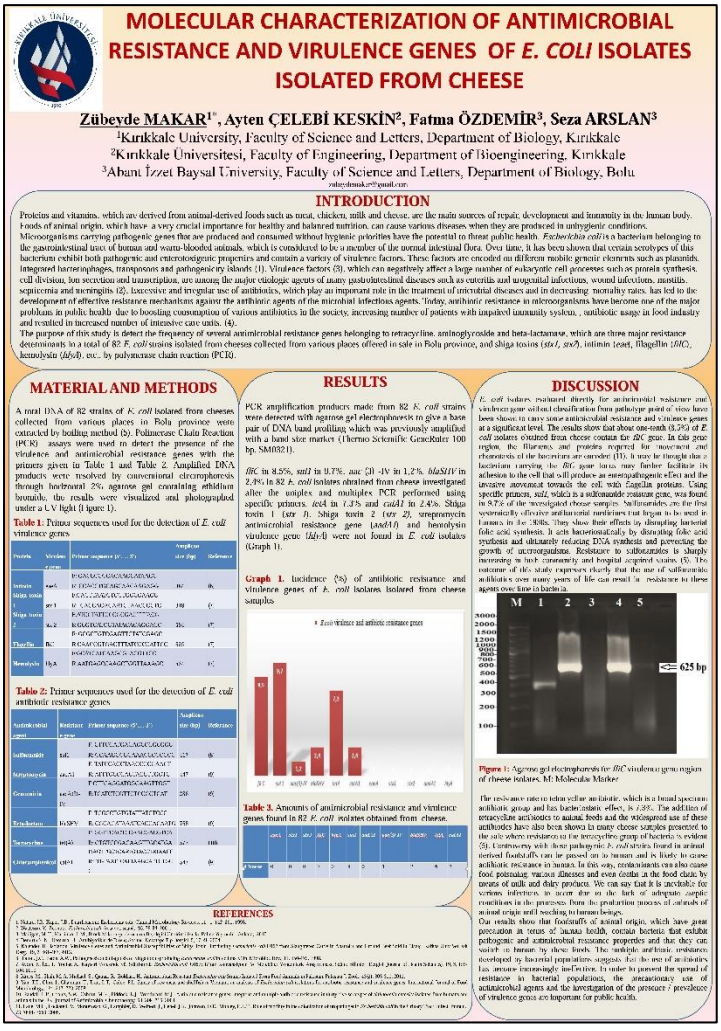

Abstract

In this study we investigated the presence and frequency of *eaeA*, *stx1*, *stx2*, *fliC*, *hlyA* virulence genes and *sul1*, *aadA1*, *aac (3) -IV*, *blaSHV*, *tetA* and *catA1* antibiotic resistance genes in 82 *E. coli* isolates isolated from cheese samples exposed for sale in Bolu province.

Antibiotic resistance genes and virulence genes of *E. coli* strains isolated from cheese samples were determined by Polymerase Chain Reaction (PCR) method.

fliC was found in 8.5% of the cheese isolates, *sul1* in 9,7%, *aac (3) -IV* in 1,2%, *blaSHV* in 2,4%, *tetA* in 7,3%, *catA1* 2,4%. Shiga toxin 1 (*stx 1*), Shiga toxin 2 (*stx 2*), streptomycin antimicrobial resistance gene (*aadA1*) and hemolysin virulence gene (*hlyA*) were not detected in cheese isolates.

As a result, it is important to prevent the spread of resistance in bacterial populations, and to seek the precautionary use of antimicrobial agents and the presence of virulence genes in terms of public health.

Keywords: *E. coli, antibiotic resistance gene, virulence gene, PCR, cheese*

Pestil Production Technology

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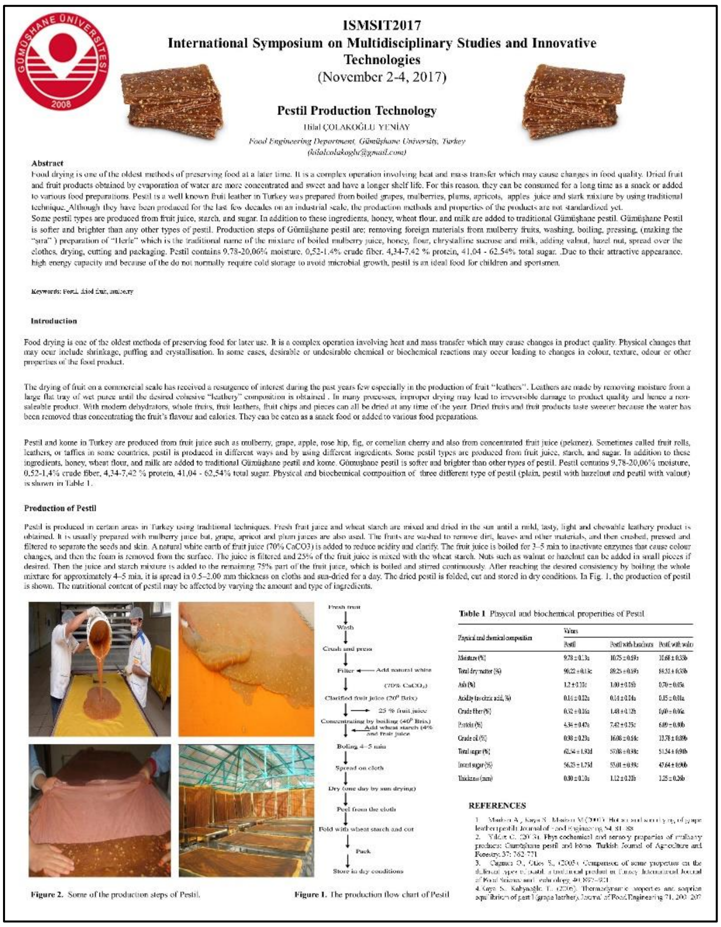

Abstract

Food drying is one of the oldest methods of preserving food at a later time. It is a complex operation involving heat and mass transfer which may cause changes in food quality.

Dried fruit and fruit products obtained by evaporation of water are more concentrated and sweet and have a longer shelf life. For this reason, they can be consumed for a long time as a snack or added. to various food preparations.

Pestil is a well known fruit leather in Turkey was prepared from boiled grapes, mulberries, plums, apricots, apples juice and stark mixture by using traditional technique. Although they have been produced for the last few decades on an industrial scale, the production methods and properties of the products are not standardized yet.

Some pestil types are produced from fruit juice, starch, and sugar. In addition to these ingredients, honey, wheat flour, and milk are added to traditional Gümüşhane pestil. Gümüşhane Pestil is softer and brighter than any other types of pestil.

Production steps of Gümüşhane pestil are; removing foreign materials from mulberry fruits, washing, boiling, pressing, (making the “şıra”) preparation of “Herle” which is the traditional name of the mixture of boiled mulberry juice, honey, flour, chrystalline sucrose and milk, adding valnut, hazel nut, spread over the clothes, drying, cutting and packaging.

Pestil contains 9,78-20,06% moisture, 0,52-1,4% crude fiber, 4,34-7,42 % protein, 41,04 - 62,54% total sugar. .Due to their attractive appearance, high energy capacity and because of the do not normally require cold storage to avoid microbial growth, pestil is an ideal food for children and sportsmen.

Keywords: *Pestil, dried fruit, mulberry.*

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Essential Oil Extraction Methods

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Abstract

Essential oils are aromatic and volatile liquids extracted from plant and spices material, such as flowers, roots, bark, leaves, seeds, peel, fruits. Essential oils have been used for centuries in medicine, perfumery, cosmetic, and have been added to foods as part of spices or herbs. Their initial application was in medicine, but in the nineteenth century their use as aroma and flavor ingredients increased and became their major employment. Almost 3000 different essential oils are known, and 300 are used commercially in the flavor and fragrances market. The organoleptic compounds, which are responsible chemical for flavor and aroma, exist at various concentration levels (ranging from ppt to pph) in plant and spices. The condition of growth of the plant like climatic, geographical, soil characteristics, a nd the part of the plant, influence the quality and quantity of the essential oils.

Essential oils have been shown to exhibit antibacterial, antioxidant, antiviral, antimycotic, antitoxigenic, antiparasitic and insecticidal properties. These characteristics are possibly related to the function of these compounds in plants. There are several traditional and modern methods for obtaining essential oils from aromatic plants. There are modern methods such as supercritical fluid extraction (SFE), microwave extraction (MWE), solid-phase microextraction (SPME), as well as conventional methods such as distillation, press and soxhlet extraction.

Keywords: *Essential oil, extraction methods, antimicrobial effect, antioxidant effect*