

World Oil Seed Congress, Lviv, Ukraine, 2019



**PROCEEDINGS
BOOK OF ABSTRACTS
FIRST WORLD OILSEEDS
CONGRESS**

NOVEMBER 6-7, 2019

LVIV, UKRAINE

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**In
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**Organized by
Trakya University**

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WELCOME NOTES

We would like to welcome you to the First World Oilseeds Congress (WOS) organized by Trakya University with supports of BYSD, MUMSAD, YABITED, TURKTOB, TSUAB, BISAB and other related associations. This congress is a premier international science, bringing together with producers, trade, industry, technology and business focusing on oilseeds. The program will include a plenary session on oilseed production, markets, economics and the policies and regulations governing oil trade. The technical sessions will highlight invited and volunteer oral presentations on congress topics.

The congress will also give an opportunity to the scientists to present their research results expanding the current knowledge in the field and the industry personnel to introduce new products which may be interest to the global oilseeds and vegetable oil community. The attendees will have ample opportunities for learning, reconnecting, engaging, networking and meeting with producers, academia, industry, marketing and trade with exhibitors. We hope that this congress will facilitate a lively dialog between the scientific community and the industry. The congress will be green congress basis so as much as less papers will be used and with carrying out our environment. Abstract book will be published as electronic book in PDF format that will be distributed during the congress.

In November 2019, it will be held the first edition of the WOS Congress, with ambition of the organizers to make it a periodical event. We are proud to announce that in the WOS 2019 will take part more than 100 scientists and researchers from all over the world. There were submitted 70 scientific papers, of which 50 will be presented as oral talks and 20 as poster presentations. The full author list of all submitted papers comprises 184.

Congress topics will cover all oilseeds (sunflower, canola, peanut, flax, sesame, cottonseed, castor, palm, olive and other oilseeds) production, breeding, agronomy, biotechnology, etc. world oilseed and oil trade, oilseed and oil chemistry, oilseed and oil industry and sector, oilseed and oil equipment, nutrition and lipids, processing and industrial applications, food applications and products and methods and standards.

Lviv is a beautiful, lovely and historic city at the eastern edge of Europe. We are thrilled to host you all in Lviv, Ukraine and hope that you will take this opportunity to discover city and around with enjoyable time. We would like to thank you for joining to this congress. We extend our special thanks and gratitude to our sponsors and collaborators for supporting this event.

We wish you a nice stay in Lviv, Ukraine.

Prof Dr Yalcin KAYA

Head of the Organizing Committee

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(28559) OILSEEDS, OILS AND FATS INDUSTRY IN TURKEY

Metin Yurdagul

Margarine Producers and Industry Association (MUMSAD), Turkey

metin.yurdagul@mumsad.org.tr

The content of the presentation is about the history of the oilseeds, vegetable oils and margarine in Turkey. Despite common thought, the history of the oilseeds and vegetable oil in Turkey doesn't go so far. Before 1950 only olive oil and animal fats used to be consumed in Turkey; while the main consumed items were cow ghee (100% fat) and butter (82% fat). At those times it was enough to meet the demand of Turkish population, which was around 21 million. Parallel to increasing population, as well as developments of industry and agriculture, oilseeds and vegetable oils production has started after the 1950s. In Turkey mostly cultivated oilseed is SFS and accordingly the most consumed oil is SF oil. Last season, a record yield of about 1.5 Mio tons of SFS was produced. Although soybean has been introduced to Turkey in 1930, it has been cultivated between 1965-70, especially in the interior part of the Black Sea Region. Unfortunately SB production is as low as 60 thousand tons today and the meal is more demanded than its oil. Even though rapeseed is an oilseed grown especially in the Thrace region in Turkey, both its cultivation and importation were banned by the government in 1977 due to the erusic acid problem. The efforts started in 1990s as canola seed hasn't created a significant effect. Today its production is something like 50 thousand tons. Turkey is a cotton grower country, so cottonseed oil is also a raw material used in our industry. Despite the decrease of its demand as a liquid oil, cottonseed oil is being used in margarine production and even for biodiesel. As its know, Turkey is the leader in hazelnut production in the world. During 1990s production of hazelnut oil has started to gain importance. As you know, hazelnut oil's fatty acid composition is quite similar to the olive oil's. Therefore, despite its high price, it has been demanded by the consumers but its quantity is still not much. After all, Turkey is obliged to import about 75% of its crude vegetable oil need annually. Olive oil can be produced only in about 6-7 countries in the world and Turkey is amongst those lucky countries who can produce this valuable oil. During the period of last 20 years there has been an important progress in olive oil production in Turkey and production amount today has reached to about 200 thousand tons. In English language, we categorize those products as fat or oil. The one which is in liquid form at room temperature is defined as oil, while the hard one is defined as fat. Therefore, general perception is to think oil is composed of unsaturated fatty acids and fat is composed of saturated fatty acids. However, all types of oils in nature contain PUFA, MUFA and around 7 to 15 percent SAFA. When we look at the history of margarine production in Turkey, although its production began in 1930, its actually the rising era has started with the arrival of Unilever in 1952. Actually, margarine is better named as spreadable fat. This year, 150th anniversary of margarine's discovery is being celebrated globally. Thanks to all the developments in this journey of 150 years, today, the product is refereed as modern margarine. The most important development is undoubtedly elimination of Trans fatty acids. Turkey is amongst the leader countries companying Denmark and Australia with respect to elimination of TFA success. TFA free era for margarines in Turkey started in 2007. With this success, Turkey is 11 years ahead of the US, 13 years of Canada and 14 years of EU.

Keywords: Oilseeds, Turkey, Fats, Oil Industry, Margarine, Crude oil, Vegetable oil

(28411) OILSEED BIOREFINERY CONCEPT FOR SUSTAINABLE PROCESSING

Nurhan Dunford

*Oklahoma State University Biosystems and Agricultural Engineering Department and Robert
M. Kerr Food and Agricultural Product Center, Stillwater, OK, USA*

nurhan.dunford@okstate.edu

The biorefinery concept is similar to the petroleum refinery except that it is based on biomass feedstock rather than crude petroleum oil. An oilseed based biorefinery would use various fractions of these crops to produce a mix of products, including fuels, power, heat, food, chemicals and materials. Although, oil and meal (residual seed material after oil extraction) are the major products of oilseed processing facilities, numerous by-products and waste streams are also generated during this process. The latter streams could be further processed to produce high value products within the same system. Such an integrated system has the potential to lower production costs and adverse environmental impact of processing and enhance societal benefits through the integration of green chemistry practices and use of environmentally benign technologies. General principles of biorefinery, zero waste integrated system, byproduct valorization and circular-economy concepts will be reviewed during this presentation. Various examples of food and non-food industrial products developed from oilseeds such as sunflower and canola seeds and soybeans will be highlighted. Pros and cons of the biorefinery concept for large and small local businesses and long-term sustainability will be emphasized.

Keywords: Oil, oilseed, biorefinery, byproduct valorization

(28041) FACTORS AFFECTING VEGETABLE OIL QUALITY

Aziz Tekin

Ankara University, Turkey

tekin@ankara.edu.tr

Vegetable oils are consumed either crude or refined state for different purposes. Some of them are used as cooking or frying oils while the others are consumed as natural oil. When they are reached to the final consumers, they have to have some quality characteristics depending on their final use for food preparation. Vegetable oil quality is mainly affected by two factors: 1. Environmental factors, 2. Cares taken for the oil quality from the field to the market shelf. The first one might lead to unavoidable deteriorations in oil quality depending upon climatic conditions but the second one can mainly be succeeded when all necessary steps are taken in terms of oil quality while harvesting, transportation, processing or storage. Vegetable oils are open to deterioration just after the harvest because of the enzymes in oil bearing materials. Besides, some environmental factors such as insects, pesticides or some harmful microorganisms may give damage to them before harvest. All these reduce fruit or seed quality hence, crude or natural oil quality as well. If quality characteristics of the oils are in accordance with the official regulations, they can be sold as natural oil, otherwise vegetable oils should be refined before final consumption. Refining is a serious of process that should reduce undesirable impurities in vegetable oils such as phosphotides, free fatty acids, colour or contaminants while protecting neutral triglycerides and desirable compounds for supplying oil quality. Refining conditions are the main factors affecting oil quality. They are applied to the oils depending on the oil type and crude oil quality. Consumer choices are also effective on the processing methods.

Keywords: Vegetable oil, quality, refining

(27910) NEW APPROCHES AND INNOVATION TECHNOLOGIES FOR EXTRA VIRGIN OLIVE OIL

Turkan Mutlu Keceli

University of Cukurova, Turkey

turkankecelimutlu@gmail.com

Olive oil; it is an oil that is consumed in recent years and preferred by consumers because of being rich in bioactive components, beneficial effect for health and high nutritional value. The production process of virgin olive oil (VOO), obtained only by mechanical or other physical methods without any purification (refining) treatment from the fruit of the olive tree, has not been changed for a long time. Many studies have been already developed during the last 10 years in order to optimize all the mechanical extraction steps that play a crucial role in the qualitative/quantitative composition of phenolic and volatile profile and, consequently, the sensory characteristics of the resulting EVOOs. Technological innovations have led to new extraction plants designed to improve the quality of oils obtained from olives with different genetic, geographical, and agronomic characteristics. One of the major challenges in the olive oil field will be the improvement of plant engineering performance in terms of sustainability, efficiency, modularity, and flexibility, reducing production costs, with attention to EVOO quality and yield. Attempts have been made for converting the traditional malaxation batch process into a continuous one, obtaining a simultaneous positive effect on both the oil yield and the working times. In order to reduce preheating phase and time and optimize the phenolic and volatile compounds related to EVOO healthy and sensory properties, different technological solutions can be adopted during olive paste conditioning: microwave energy, mechanical vibrations, pulsed electric field (PEF), ultrasounds (US) and flash thermal conditioning (FTC). The innovative EVOO process technologies have several advantages useful to improve olive miller income: higher yield extraction, higher polyphenols and lower bitter and pungent taste than traditional EVOO samples.

Keywords: Extra virgin olive oil, Non thermal processing Techniques, PEF, Ultrasonic Power, Microwave energy, flash thermal conditioning (FTC), high yield, quality, new technologies

(26766) THE FATTY ACID CONTENT OF SEEDS OF WINTER RAPESEED VARIETIES OF THE DIFFERENT BREEDING CENTERS

Yevhenii Zaika¹, Oleksandr Drozd², Tetiana Kyrpa-Nesmiian²

¹ *National Scientific Center "Institute Of Agriculture of NAAS", Ukraine*

² *NSC "Institute of Agriculture of NAAS", Ukraine*

Za-ika@ukr.net

The paper describes researches of 33 winter rapeseed varieties and hybrids of Ukrainian and Foreign breeding centers by fatty acid composition. Fatty Acids were extracted by the seeds by N-Hexane and esterified by KOH in methanol (ISO 5509-2000). Fatty Acid Content of rape seeds was determined by Gas Chromatography by ISO 5508-2001. In all genotypes have the observed the high rate of oleic acid (60.64 %), linoleic acid (19.09 %), linolenic acid (8.72 %), and palmitic acid (4.58 %) in seeds. The scope of researches was to identify the genotypes with the optimal proportion of fatty acids for plant breeding. The higher oleic acid content was 64.70 % and increased linoleic acid content was 22.32 %. All varieties have favorable content of oleic acid which is optimal for the food industry. But the high linolenic acid content is not good for frying characteristics of the oil. Also, the strong negative correlation (-0.83) between oleic acid and linolenic acid content was established and between oleic acid and linoleic acid content (-0.68), the strong negative correlation observed too. As a result of the study, were determined the genotypes, which can be genetic sources of high oleic acid content and other fatty acids for varieties breeding.

Keywords: Rapeseed, Fatty acid content, Oleic acid, Oil content.

(28667) SUNFLOWER PRODUCTION IN BLACKSEA REGION: THE SITUATION AND PROBLEMS

Yalcin KAYA

Trakya University, Engineering Faculty, Genetic and Bioengineering Dept, Edirne, Turkey

yalcinkaya22@gmail.com

Sunflower is one of the most important oil crops in the world. In addition to be the most preferable vegetable oil in the Eastern Europe, Balkans and Blacksea region, sunflower is the main crops in the rotation system in the agricultural production as well as the most planted oil crops in these areas. Both world sunflower planted areas (21.000 ha in 2007 to 26.000 ha in 2019) and also seed production (26.000 MT in 2007 to 51.000 MT in 2019) have raised in last ten years but Blacksea region contributed mainly for these increases. In the region, while sunflower production has tripled from 11800 MT (2007) to 35.000 MT (2019), sunflower planted areas has raised 60% more from 2007 to 2019 (10.000 to 16.000 ha) in last 12 years. The rate of region in sunflower production has increased from 45 to 68%, acreages from 49 to 64% in this period. Furthermore, the region plays key role and also dominated sunflower world trade as well as other oilseeds such as canola and soybean. As a spring crop, sunflower influence eventually from climatic conditions such as temperature, soil humidity, etc. in some critical stages which are determining seed and oil yield especially bud formation and the grain filling period. Biotic and abiotic stresses coincide in these two stages lead extremely reduce seed yield regularly in sunflower production areas in due to unregularly rainfalls and higher temperatures in spring and early summer seasons in Blacksea region which sunflower grows mostly in dryland. Therefore, it need to well understand these reducing factors and sunflower responses and mechanisms then it need to find accurate management solutions to cope with these factors efficiently such as early planting time and increasing plant density for obtaining better yields. Besides, biotic stresses mostly diseases such as downy mildew, *Phomopsis*, *Sclerotinia*, *Verticilium* wilt, *Macrophomina* and also broomrape parasite, weeds are the main factors reducing sunflower yield in the region. While there is only genetic resistance possible for disease control mentioned above ones, effective control of broomrape and weeds are possible Clearfield system with post emergence Imidazolinone (IMI) herbicide plus resistant varieties as well as sulfonyl Urea (SU) herbicide and resistant hybrids. Furthermore, combining these herbicide resistances together with new races of broomrape races and downy mildew and other diseases will lead higher yield results in sunflower production in the region in addition to other agronomical solutions.

Keywords: Sunflower, Blacksea, Seed production, Hybrid breeding, Stress conditions.

(28201) DRY TRIBO-ELECTROSTATIC PROTEIN ENRICHMENT OF OILSEED MEAL

Tomasz Wolak

St Equipment, Poland

twolak@steqtech.com

Electrostatic separation is a completely dry process requiring no water or chemicals. Dry electrostatic separation methods offer an opportunity to generate oilseed meal with increased protein content for use as a high value animal feed. A sample of hexane extracted sunflower seed meal was obtained by the researchers. Two meal samples were finely milled (dry), the first with a hammer mill, and the second with an air classified mill. The ground oilseed meal samples were then separated using a high throughput tribo-electrostatic belt separator. Finely milled dry sunflower seed meal samples demonstrated significant separation of protein. For the coarser (d50 = 70 micron) sample, the feed sample containing approximately 40% protein (dry basis) was separated into a product containing 52% protein and a by-product with a 29% protein, in a single pass through the high rate electrostatic separator. For the finer (d50 = 25 micron) sample, a product with a 53% protein content was generated, with a by-product with 25% protein, in a single pass through the separator. The tribo-electrostatic belt separator demonstrated the capability to process finely ground sunflower seed meal to significantly upgrade the protein content, making it more valuable as an animal feed. This separation was achieved without the addition of water or chemicals. The tribo-electric belt separator is a high rate, low energy usage, industrially proven processing device suitable to commercialize the recent developments in electrostatic food and feed processing.

Keywords: protein enrichment, fiber reduction, oilseed meal beneficiation, protein shifting

**(27786) COMPARISON OF DIFFERENT FERTILIZATION VARIANTS ON
Camelina sativa YIELD, PLANT HEIGHT AND OIL CONTENT**

*Peter Hozlar*¹, *Katarína Matúšková*¹, *Petra Ondrejčíková*², *Elena Hájeková*³, *Ludmila Joriková*⁴

¹ *NPPC, Slovakia*

² *Association Energy, 21, Slovakia*

³ *Slovak University of Technology, Slovakia*

⁴ *Vurup A.S., Slovakia*

peter.hozlar@nppc.sk

Oilseed plant *Camelina sativa*, the member of mustard (*Brassicaceae*) family, represents re-emerging low input oilseed energy crop with sustainable agronomic characteristics and environmental attractiveness. *Camelina* is a short-season crop adapted to the cool temperate regions of Europe, Asia, and North America. Although no original Slovak varieties are known to be preserved, *Camelina* recently attracts interest of Slovak agronomists and biofuel producers as it possesses many traits that make it an ideal candidate for the crop rotation schemes even on marginal lands and subsequent utilization for oil production. As a potential feedstock for the production of bio-components to fuels *Camelina* can contribute to achieve the increase of GHG savings. Main focus of this study was aimed to examine the effect of different fertilization conditions on *Camelina sativa* yield, plant height and oil content in Slovak region. Additionally, comparison study of two available varieties Zuzana (Czech variety) and Smilowska (Polish variety) was performed. Field trials evaluating 12 fertilization variants were conducted on spring 2018 and 2019 (as part of a long-term stationary experiment, founded in 1957), at the Research and Breeding Station Vígľaš-Pstruša, Slovakia. Nitrogen doses varied from 0, 40, 80, 120 to 150 kg.ha⁻¹ and were split into one to four dosages with or without P₂O₅ and K₂O fertilizers. If fertilized with P₂O₅ and K₂O, these were applied once prior to seeding. The evaluated factors were: (A) – fertilization (12 fertilization variants), (B) – *Camelina* varieties (Zuzana, Smilowska) and (C) – year of study (2018, 2019). The influence of all factors on the yield, the height of plant and the oil content were assessed through multi-factor ANOVA. The study showed that fertilization with nitrogen and phosphorous has positive impact on seed yield, which is in accordance to literature. Fertilization with nitrogen has positive effect on plant height. The growing conditions of each year/season have largely influenced the seed yield as well as the height of the plants. It has been observed that oil yield is strongly related to temperature and precipitation conditions in each year as well as presence of fertilizers and type of *Camelina* variety. This work was supported by the Slovak Research and Development Agency under the contract No. APVV-16-0097 and contract No. APVV-16-0051.

Keywords: *Camelina sativa* (false flax), Fertilization, Seed yield, Oil content.

**(27925) VARIABILITY OF QUANTITATIVE PROPERTIES IN OILSEED RAPE -
Brassica napus L., AND EFFICIENCY FROM APPLICATION OF CERTAIN
MACRO AND MICROELEMENTS**

*Igor Iljovski*¹, *Zoran Dimov*¹, *Romina Kabranova*², *Ile Canev*¹

¹ *Faculty of Agricultural Sciences and Food in Skopje, Macedonia*

² *Faculty Of Agricultural Sciences and Food in Skopje Ss. Cyril and Methodius University,
Macedonia*

romina@fzh.ukim.edu.mk

Determination of quantitative characteristics by using macro and microelements that have great importance on the development of oilseed rape - *Brassica napus* L. started by setting the experiment (2014), and applying Mg and Mn as elements corresponding for the purpose. The trials were set in order to see the impact of magnesium and manganese on the quantitative properties of winter oilseed rape genotypes - *Brassica napus* L. For this purpose, certain concentrations of magnesium sulphate and manganese chelate by foliar fertilizer application was applied on 3 genotype winter oilseed rape (Hybrirock, Petrol and Speed) in 5 variants, as follows: Variant 1 Control Ø NPK, Variant 2 NPK+MgSO₄ 25%, Variant 3 NPK+MgSO₄ 35%, Variant 4 NPK+Mn chelate 20%, and Variant 5 NPK+Mn chelate 30%. By specifying the appropriate fertilizers with Mg and Mn (their concentrations), except for quantitative properties, the adaptability of the tested genotypes of specific agro-climatic and soil conditions was observed and the following parameters were monitored: plant height (cm), the number of branches/plant, number of pods/plant, pod length (cm), the number of seeds in the pod and seed yield (t/ha). According to the results of the preliminary experiment can be concluded that higher concentrations of magnesium sulphate (35%) and manganese chelate (30%) leads to increased the components of yield and seed in tested genotypes. Efficiency of variants, generated by certain concentrations of fertilizers has also confirmed impact of higher concentrations; in terms of dosages and prices of yields (NPK+Mn chelate 30% and NPK+Mg SO₄ 35%).

Keywords: oilseed rape, Magnesium, Manganese, yield, efficiency

(27955) BROOMRAPE (*Phelipanche ramosa* (L.) POMEL) CONTROL IN WINTER OILSEED RAPE WITH IMAZAMOX-CONTAINING HERBICIDE PRODUCTS

Mariyan Yanev¹, Anyo Mitkov¹, Nesho Neshev², Tonyo Tonev¹

¹ Agricultural University of Plovdiv, Bulgaria

² Agricultural University of Plovdiv, Bulgaria

n_neshev85@abv.bg

The broomrapes are root, obligate parasites without chlorophyll. They parasitize mostly the dicotyledonous plants. *Phelipanche ramosa* (L.) Pomel attacks a wider range of hosts among which is the winter oilseed rape (*Brassica napus* L.). The broomrape can reduce the yields and aggravate the quality of production. There are few effective measures to control this parasite. One of the most promising approaches is the cultivation of Clearfield® oilseed rape and the treatment with imazamox-containing herbicide products. For this purpose during the growing seasons of 2016 - 2017 and 2017 - 2018 a field pot experiment with the Clearfield® oilseed rape hybrid PT 228 CL was conducted. The soil of the field pots was artificially infested with *Ph. ramosa* seeds. The herbicide application was performed in two stages of the crop in the spring - BBCH 31–33 (1-3 internodes visible) and BBCH 51 („green button“). Variants of the trial were: 1. Untreated control; 2. Cleranda® (375 g/l metazachlor + 17,5 g/l imazamox) – 2,00 l/ha (BBCH 31–33); 3. Cleravo® (250 g/l quinmerac + 35 g/l imazamox) – 1,00 l/ha (BBCH 31–33); 4. Pulsar® Plus (25 g/l imazamox) – 1,00 l/ha (BBCH 31–33); 5. Pulsar® Plus – 2,00 l/ha (BBCH 31–33); 6. Pulsar® Plus – 0,50 l/ha (BBCH 51); 7. Pulsar® Plus – 1,00 l/ha (BBCH 51); 8. Pulsar® Plus – 2,00 l/ha (BBCH 51). Average for both years of the study, the highest efficacy against the parasite after the application of Pulsar® Plus – 2,00 l/ha (BBCH 51) – 92,9% followed by Cleranda® (375 g/l metazachlor + 17,5 g/l imazamox) – 2,00 l/ha (BBCH 31–33) - 91,2% was reported.

Keywords: Winter oilseed rape, broomrape, control, imazamox, efficacy.

(26423) PROXIMATE AND MINERAL COMPOSITION OF SELECTED SOYBEAN GENOTYPES IN NIGERIA

Dickson Junior Nwosu¹, Mayowa Olubiyi², Sunday Aladele², Benson Apuyor³, Myung-Chul Lee⁴

¹ *National Centre For Genetic Resources and Biotechnology (Nacgrab), Ibadan- Nigeria*

² *National Centre For Genetic Resources and Biotechnology (Nacgrab), Ibadan, Nigeria*

³ *National Cereals Research Institute (Ncri) Badeggi, Nigeria*

⁴ *National Agrobiodiversity Centre, Rural Development Administration, Republic of Korea*

dicksonnwosu@gmail.com

An experiment was conducted at the Central Services Laboratory of the National Cereals Research Institute, Badeggi, Nigeria to evaluate proximate and mineral composition of eight soybean accessions (NG/MR/11/11/060, NG/SA/07/100, NG/SA/JAN/09/48, NGB00111, NGB00113, NGB00116, NGB01318) conserved in the National Genebank at National Centre for Genetic Resources and Biotechnology (NACGRAB), Ibadan, Nigeria and twelve varieties (TGX1019-2EB, TGX1019-2EN, TGX1440-1E, TGX1448-2E, TGX1485-1D, TGX1835-10E, TGX1904-6F, TGX1951-3F, TGX1987-62F, TGX1989-19F, TGX923-2E, TGX1987-10F) developed at National Cereals Research (NCRI) in collaboration with International Institute for Tropical Agriculture (IITA) and The result showed wide significant variations in the proximate and mineral contents. TGX1987-62F recorded the highest dry matter content of 98.34% while TGX 923-2E gave the highest moisture content (6.12%). Highest values for Crude ash (5.02%) and crude fibre (6.12%) were recorded for TGX1951-3F. NGB00116 had the significantly highest protein content of 41.92% and an appreciable oil content of 27.65%. Protein content was also high for TGX1987-10F (41.33%) and NG/MR/11/11/060 (41.31%). TGX1989-19F had the highest oil content of with 30.45% and energy value (496.37Kcal/g). NGB00113 had the highest carbohydrate content of 52.74%. K, Na, Ca, Mg and P were highest in NG/SA/JAN/09/48 (1.99%), NGB00116(0.57%), TGX1485-1D (1.60%) TGX1951-3F (0.84%) and NGB00113 (0.85%) respectively. The study provides valuable information on soybean genotypes with very high protein and oil content for recommendation to farmers and other end users and for breeders to select and utilize in soybean quality improvement programmes.

Keywords: accessions, protein content, oil content, soybean

(28547) IMPACT OF NaCl DOSES ON GERMINATION AND EMERGENCE OF PRIMED SEEDS OF LINSEED (*Linum usitatissimum*) CULTIVARS

*Sibel Day*¹

¹ *Ankara University, Turkey*

day@ankara.edu.tr

Four linseed cultivars Linda, Linton, Avangard, and Bonnydoon (originated from France, USA, Russia, and Australia respectively) were used in the experiment. Distilled water was used for hydro priming and NaCl concentrations with the electrical conductivity (EC) values of 10 and 20 dS m⁻¹, respectively were used in the germination and seedling emergence tests. Four replicates of 50 dried primed and non-primed seeds were used in both germination and emergence tests. The experimental design was 3 factors factorial (4 × 2 × 3) arranged in a completely randomized block design with four replicates. The first factor was linseed genotypes, the second was priming and the third one was NaCl levels. The seeds of the linseed cultivars were imbibed for 8 h with distilled water and then surface dried by blotting paper and left to dry at room temperature (25 °C) back to original moisture content. The non-primed seeds were used as control. Considering cultivars, Linton gave a higher germination percentage under all NaCl levels. There was no big difference between unprimed and primed seeds in germination percentage. The time to seed germination was not as expected from hydro priming due to the unprimed seeds mostly had shortened germination time. Unprimed seeds had a higher shoot length compared to primed seeds. In germination and emergence tests hydro primed seeds did not show the expected germination and emergence performance. Germination and emergence percentage of unprimed seeds are better compared to hydro primed seeds. Even the time to germination and emergence was better in unprimed seeds.

Keywords: Linseed, seed priming, NaCl

(27991) BREEDING OF *Camelina sativa* IN POLAND

Danuta Kurasiak-Popowska¹, Kinga Stuper-Szablewska¹

¹ Poznan University of Life Sciences, Poland

danuta.kurasiak-popowska@up.poznan.pl

Camelina sativa L. is one of the oldest crops of the *Brassicaceae* genus. The plant is of eastern European / western Asian origin. *Camelina sativa* is an annual plant characterized by a high adaptation to different climatic and soil conditions and a high level of resistance to diseases and pests. It is a species whose cultivation is simple and environmentally friendly. The first field experiments with *Camelina* were conducted in Poland (near Poznań) in the late 19th century. Until 1955 camelina was the second most common oil-bearing crop in Poland, but later it was almost completely replaced by rapeseed. Currently the area of camelina cultivations has increased both in Europe and North America. Camelina is grown mainly due to the high content of oil in seeds. The oil is rich in linoleic, linolenic and eicosenoic acids. Camelina oil is used for food and feed purposes and for industrial purposes, including the production of biofuel. However, there are too few registered camelina cultivars because the seed material collected by breeders is characterized by low biodiversity. In the Department Genetics and Plant Breeding in Poznan University of Life Sciences the use of mutagenesis in breeding of Camelina was carried out since the 1980s. Among the 5 cultivars protected by national plant breeders' rights in Poland, 4 cultivars were bred at the Poznań University of Life Sciences, Poland. In Poland, the average yields of winter crop varieties of Camelina is from 2,000 to 3,000 kg ha⁻¹, and the yield of spring lines varied from 1,500 to 2,000 kg ha⁻¹. The yield of camelina depended on the weather conditions in individual years. For many years in eastern Europe there have been larger areas of winter camelina plantations due to their higher yields and greater resistance to unfavorable soil and climatic conditions.

Keywords: *Camelina sativa*, mutagenesis, low biodiversity

(28016) DEVELOPMENT AND CHARACTERIZATION OF A RAPESEED MUTANT LINE COMBINING VARIOUS DESIRABLE TRAITS

Abdelghani Nabloussi¹

¹ *INRA, Morocco*

abdelghani.nabloussi@gmail.com

Mutagenesis breeding is an efficient strategy to improve rapeseed for yield and quality parameters. A mutagenesis breeding program was initiated in 2014, by treating seeds of a Moroccan rapeseed variety by Ethyl Methyl Sulphonate (EMS), with 1% concentration during seven hours. As a result a promising mutant ('H2M-5'), combining desirable agronomic, phenological and quality traits, was obtained. Field trials as well as laboratory experiment were conducted to evaluate this mutant for earliness, agronomic traits, quality parameters and response to changing environments. Compared to the check (wild type variety), this mutant was more interesting and exhibited a genetic progress for most of the parameters investigated. First, it is earlier to flowering and maturity, has higher number of pods per plant, and is characterized by higher branching and shorter plants. Second, the 'H2M-5' mutant line produces higher seed oil and total phenolic content. Third, it is shown to have phenolic extracts with better antioxidant activity, according to ABTS and DPPH radical scavenging activities. Furthermore, this material has exhibited more tolerance and adaptation than check to stressful environment conditions associated with low rainfall, waterlogging, high temperature and contrasted sowing dates. Obtained results will be presented and discussed. This promising mutant, exhibiting its stability throughout M1, M2 and M3 generations, will be valuable and useful for fast development of productive, adapted and high quality rapeseed cultivar.

Keywords: Rapeseed, EMS mutagenesis, earliness, seed oil, total phenolic content, antioxidant activity

(28238) MAPPING OF NLP RECOGNITION AND IMMUNE RESPONSE IN *Brassica napus* BY BULK-SEGREGANT ANALYSIS

*Hicret Asli Yalcin*¹, *Ricardo H. Ramirez Gonzalez*¹, *Rachel Wells*¹, *Christopher Ridout*¹

¹ *John Innes Centre, UK*

hicret.yalcin@jic.ac.uk

Brassicac are important crops susceptible to significant losses caused by disease. Breeding resistant lines can mitigate the effects of pathogens. The first level of the plant immune response is PAMP-triggered immunity (PTI). PAMPs (Pathogen associated molecular pattern) are conserved pathogen molecules that elicit host defence response. We studied the response to Necrosis & Ethylene-inducing peptide 1-like proteins (NLPs) in *Brassica napus*. NLPs are found in a wide range of phytopathogens, including major disease-causing fungal species that infect Brassicas. Therefore, improved understanding of the NLP recognition mechanisms could enable disease resistant crops to be developed. The aim of the study is to map the responsible regions and genes in *B. napus* genome linked to NLP recognition and understand their contribution to the immune system. To identify genes controlling NLP response, Bulk Segregant Analysis (BSA), has been used. A segregating population was developed from a cross between two NLP responsive and non-responsive oilseed rape accessions. To create the diverse DNA pools, the production of Reactive Oxygen Species (ROS) in response to NLPs was measured in 925 F2 lines. The segregation ratio indicates there is both a qualitative and quantitative aspect to the NLP-response. Illumina sequencing was performed on pooled DNA. The outcome will be analysed by comparing to parental genotypes. Results will enable identification of genetic markers that could be used to develop more durable disease resistance in Brassicas.

Keywords: *Brassica napus*, PAMP Triggered Immunity, Necrosis & Ethylene-inducing peptide 1-like proteins (NLPs), Bulk Segregant Analysis (BSA)

(28317) CHARACTERISTIC FEATURES OF THE BIOCHEMICAL COMPOSITION OF WINTER RAPE SEEDS RESISTANT TO POST-EMERGENT HERBICIDES

*Ivanna Sholonkevych*¹

¹ *Precarpathian State Agricultural Research Station of the National Academy of Agrarian Sciences of Ukraine, Ukraine*

instapv@i.ua

Growing the modern hybrids of winter rape is one of the main ways for attaining greater crop productivity. They must have a high potential of the crop yield, be suited to environmental conditions and highly tolerated to diseases, lodging and shattering. One priority direction of selective breeding of rape is the creation of winter rape hybrids resistant to post-emergent herbicides. Clearfield® production system for rape is a combination of Nopasaran® herbicide and high-yielding rape hybrids that are resistant for that herbicide. A single introduction of Nopasaran® herbicide (with Metolat® sticking agent) helps to destroy not only the weeds that grew before treatment but to create a soil herbicide screen, which inhibits the further waves of weeds. Clearfield® production system is suitable for rape cultivation technologies for classic and minimal or zeroes soil processing. We may achieve good results even on the soils with high organic content, on the rocky soils, at moisture deficit and other difficult circumstances. Clearfield® production system simplifies the weed control for farmers due to reduction of herbicide treatments. As a result, they have more time to focus on other factors reducing the crop yield. Selection breeding of winter rape hybrids is conducted in this direction in Precarpathian State Agricultural Research Station of the National Academy of Agrarian Sciences of Ukraine since 2015. There was created a working commission by involving the best national and foreign samples within the specified period. The available material has a high resistance to the specified herbicide and the crop yield no less than four hundred kilograms per hectare. The resistance of rape hybrids to Nopasaran® herbicide was obtained by traditional selection without genetic engineering method. The oil content in seeds of the testing samples fluctuates from 37.85% in a sample UG-165 to 48.52% in a sample UG-112. The four fatty acids that are palmitic acid, oleic, linoleic, linolenic conclude the basis of this vegetable oil. However, their content in the oil is significantly different. Oleic acid accounts for the largest share among all listed acids. The acid content ranges from 60.22% in sample UG-124 to 82.05% in sample UG-147. The most samples of the testing collection are characterized by a content of linolenic acid, which ranges from 9.31% in sample UG-127 to 20.58% in sample UG-95. The greatest changeability is peculiar to linolenic acid, which content in the seeds of tested selection material ranges from 3.45% in sample UG-42 to 7.21% in sample UG-54. Palmitic acid is the less variable among the fatty acids included in the oil. We may find the minimal content of the acid in sample UG-27, which ranges from 2.38% to 4.92% in seeds of sample UG-18. No seed samples include erucic acid and the content of glucosinolates does not exceed 18 micro molar units per gram. The plants of the collection are quite different in structure and colour of leaves (from light green to dark green), the colour of flowers (light yellow, golden yellow, dark yellow).

Keywords: Acids, Breeding, Glucosinolates, Herbicides, Hybrids, Oil, Rape

(28029) STUDY ON IMPORTANT BIOCHEMICAL INDICES IN THE SEEDS OF SOME SUNFLOWER HYBRIDS AND THEIR CORRELATION

Nina Nenova¹, Daniela Valkova¹

¹ *Dobrudzha Agricultural Institute, General Toshevo, Bulgaria*

nina_n13@abv.bg

A three-year study was carried out on various indices related to oil content in the seed of the hybrids –Enigma, Baikal and Deveda, developed through combined usage of interspecific hybridization and the embryo cultivation method. The indices 1000 seed weight (g), kernel and husk (%), oil content in kernel and oil content in seed (%), protein content (%). The experimental data were processed with dispersion, correlation and regression analysis. The obtained results showed that the investigated hybrids did not differ by their genetic potential and the environment did not affect or were slightly influential on the indices chosen. The mathematical models clearly demonstrated that the index 1000 seed weight was directly proportional to kernel (%) and reversely proportional to husk (%). Similarly oil content in kernel (%) was reversely proportional to the index kernel (%), which showed that the large-seeded varieties had lower oil content in seed in comparison to the small-seeded ones.

Keywords: sunflower, oil content, seed, kernel, husk, dispersion, regression, correlation

**(28065) STUDIES ON SOME BIOCHEMICAL CHARACTERS OF HYBRID FORMS,
ORIGINATED FROM WILD HELIANTHUS SPECIES**

Daniela Valkova¹, Nina Nenova¹

¹ *Dobrudzha Agricultural Institute, General Toshevo, Bulgaria*

valkova_d@abv.bg

This study presents the evaluation of hybrid forms, obtained as a result of interspecific hybridization between three sunflower inbred lines and wild perennial species *H. glaucophyllus* (accession M-013) from the collection of wild *Helianthus* species at Dobrudzha Agricultural Institute, on various indices related to the content of oil, protein and fatty acids in the seed. The selected accession, used as paternal parents in the crosses and the obtained hybrid material, were previously tested and evaluated as resistant to leaves pathogens. The results showed very good statistical authenticity of the analytical hypothesis that the investigated hybrid forms were with different genetic potential on the studied indices, pointing to the existence of high variability among the used wild germplasm. Hybrid forms, resistant to leaves pathogens, with high oil and protein and varied fatty acid composition were obtained. They will be included in sunflower breeding programs for diversification of initial genetic material.

Keywords: interspecific hybridization, *Helianthus glaucophyllus*, seed oil content, seed protein content, fatty acids

(28323) IDENTIFICATION AND CHARACTERIZATION OF *Cladosporium cladosporioides* ON SOYBEAN SEED

*Rustem Ustun*¹, *Ahmet Cat*¹, *Mursel Catal*¹, *Bulent Uzun*¹

¹ *Akdeniz University, Agricultural Faculty, Turkey*

rustemustun@akdeniz.edu.tr

Cladosporium is a significant genera of fungi widely distributed around the world. It is generally considered as secondary invader after the plants infected with the pathogens. This study was carried out to detect the seed borne diseases associated with soybean seeds. For this aim, soybean seeds displaying disease symptoms were collected from the experimental field of Akdeniz University, Antalya, Turkey. For Identification, symptomatic soybean seeds were first surface sterilized using 10% NaClO for 1 min, rinsed with sterile water for 1 min and then placed on Petri plates containing potato dextrose agar (PDA) and incubated at 24°C for 7 days for sporulation. Colonies of the fungus on PDA were dark-green and showed a smooth texture when examined under the light microscope. Based on the morphological observations the fungus was identified as *Cladosporium* sp. To further confirm morphologic identification, genomic DNA was extracted and amplified with ITS 1 and ITS 4 primers. Amplified PCR product was sequenced and the sequences were aligned using the MEGA 7 software. The fungus was identified as *Cladosporium cladosporioides* based on the analysis of the sequence data. Phylogenetic analysis were also made using the neighbour joining method and compared with *Cladosporium* isolates deposited in Genbank.

Keywords: *Cladosporium cladosporioides*, Soybean, Seed, ITS region

**(28546) IMPACT OF EXCESS LEVELS OF BORON ON GERMINATION OF
LINSEED (*Linum usitatissimum*) PLANTS**

*Sibel Day*¹, *Gokhan Sadi*², *Muhammad Aasim*³

¹ *Ankara Universtiy, Turkey*

² *Karamanoglu Mehmet Bey University, Turkey*

³ *Konya Necmettin Erbakan University, Turkey*

day@ankara.edu.tr

Boron (B), which is an important micronutrient element, takes a part in biochemical, physiological and morphological progress of plants. When the amount of soil Boron is higher than the required amounts for plants, it leads to physiological and biochemical changes in plants. Linseed seedlings have a poor competitive ability due to the slow development of seedlings. In this study, four different linseed genotypes (Linda, Linton, Avangard, Bonny Doon) were germinated under different concentrations of B (0, 2, 4, 8, 16, 32, 64, 128 mg/L) and were subjected to biochemical analysis in different time periods (6, 12 and 18 hours of germination) to detect molecular and biochemical modifications in seeds of linseed cultivars under toxic Boron levels. Biochemical diversity among the four different linseed genotypes concerning oxidant and antioxidant parameters (phenolics, flavonoids, β -carotene, lycopene, DPPH scavenging activity, MDA, proline, SOD, CAT, APx, and GR) were investigated and the most sensitive and resistive genotypes were determined. The results revealed that the most sensitive cultivars were Avangard and Bony Doon while the most resistant cultivars were Linda and Linton. Screening the germination of linseed under B stress will allow us to determine germplasm for boron toxicity and breed alternative oilseed plants for boron toxic agricultural land.

Keywords: Linseed, Boron, Toxicity, Oxidative stress, Proline, Antioxidant enzymes

(28052) CONDITION AND PROSPECTS OF OILSEED PRODUCTION IN UKRAINE IN THE CONTEXT OF THE GLOBALIZATION

Svitlana Hrynkevych¹, Maryana Kohut¹

¹ *Lviv National Agrarian University, Ukraine*

lidervit@gmail.com

The main trends in the world oilseeds market are described. It is revealed that the market of oilseeds is characterized by high dynamics of development. The structure of oilseeds cultivation by their species in the world is investigated. A significant share in the Ukraine's oilseeds structure of sunflower, rapeseed, and soybeans is revealed. The world demand and supply for sunflower seeds is outlined. The analysis of importing and exporting countries of oilseeds in the world is made. The importance of the influence of the Polish oilseed production market on the development of the Ukrainian oilseed market is substantiated. The dynamics of world oilseeds production and the share of Ukraine and Poland are analyzed. The state and prospects of oilseed production both in Ukraine and Poland are investigated. It is revealed that in Poland the main oilseed plant is rapeseed, and in Ukraine sunflower is predominant. We saw an increase in oilseed production both in Poland and Ukraine. The structure of demand for oilseeds has been investigated. It is justified that the growing demand for oilseeds in Poland is related to the development of biofuel production, while in Ukraine it is due to the growing demand on the world oilseeds markets and oilseeds in general.

Keywords: oilseeds, production, consumption, global market, international trade

**(27054) SPECTRAL-LUMINESCENT PROPERTIES OF LINSEED OIL OF
DIFFERENT BACKGROUND**

*Roman Shevchuk*¹, *Stepan Myagkota*¹, *Andriy Pushak*², *Volodymyr Paslavskyi*¹, *Oleg Sukach*¹

¹ *Lviv National Agrarian University, Ukraine*

² *Lviv National University, Ukraine*

smyagkota@gmail.com

The spectral-luminescent properties of linseed oils of various backgrounds have been investigated. High informative value of oil fluorophores (tocopherols, polyunsaturated fatty acids, vitamins, pigments) have been reported for their native state, depending on the action of various destructive factors (extended storage period of oil (three years), exposure to sunlight for 50 hours, and contact with temperatures in the range ($60\text{ }^{\circ}\text{C} > t > 46\text{ }^{\circ}\text{C}$). In the case of the mentioned factors in the luminescence spectra and luminescence excitation spectra, new bands appear which are attributed to oxidation products of tocopherols, polyunsaturated fatty acids and vitamins.

Keywords: Oil, Luminescence

(27909) PROCESSING, USAGE AND FUNCTIONAL PROPERTIES OF GRAPE SEED OIL

Turkan Mutlu Keceli

University of Cukurova, Ukraine

turkankecelimutlu@gmail.com

Grape seeds, a winemaking by-product, contain a substantial percentage of unsaturated fatty acids, tocopherols and tocotrienols which support their potential applications in food, nutraceutical and cosmetic industries. Grape seed oil, also known as grape oil, is an edible oil extracted from the seeds of grapes. After the wine is produced by pressing grapes, the seeds are used for extracting this oil and thus it is a by-product of winemaking. This oil has received a lot of attention in recent years due to its high levels of polyunsaturated fats and its versatility in both culinary applications and natural medicinal practices. It is claimed that high-quality grape seed oil is characterized by light flavor with fruity touches, high smoke point (216 °C), high digestibility, and a slight increase in viscosity when used for batch frying. Extraction by physical means using a hydraulic or a screw press is also possible. Solvent extraction using hexane is the most widely used procedure on an industrial scale, although extraction with supercritical CO₂ has been proposed. Grape seed oil cannot be considered suitable for table use without undergoing a refining process. The grape seed oil contains unsaturated fatty acids including 12-26 % oleic and 58 to 77 % linoleic acid. Grape seed oil is also rich in sterols (2400 to 3100 mg/kg) and tocopherols (137–934 mg/kg). Additionally, this oil is reported to contain minor components such as phenolic compounds (between 59 and 360 mg gallic acid equivalent (GAE)/kg). The total sterol content of grape seed oil is higher than that of sunflower or rapeseed oil, and lower than that of soybean oil. From the nutritional and therapeutic point of view, grape seed oil has a high linoleic acid content (important for prostaglandin synthesis, which has an influence on platelet aggregation and inflammatory processes), high vitamin E content (helps to reduce the risk of suffering from arteriosclerosis) and low values of cholesterol, and therefore it is recognized that its intake may be beneficial to prevent heart and circulatory problems. Grape seed oil is rich in unsaturated fatty acid and vitamin E (tocopherols and tocotrienols) and exhibits high antioxidant activities which make it increasingly attractive in culinary, pharmaceutical, cosmetic and medical applications.

Keywords: Grape seed oil, Extraction and Processing, Usage, Functional and Biochemical properties, Quality

(28011) PHYSICOCHEMICAL CHARACTERISTICS OF ALGERIAN AND TURKISH *Pinus halepensis* SEED OILS EXTRACTED BY DIFFERENT METHODS

*Sihem Ait Atmane*¹, *Zeynep Aksoylu Ozbek*², *Pelin Gunc Ergonul*³, *Bachra Khettal*¹

¹ *University of Bejaia, Algeria*

² *Manisa Celal Bayar University, Turkey*

³ *Manisa Celal Bayar University, Engineering Faculty, Food Engineering Department, Turkey*

pelin.ergonul@cbu.edu.tr

Pinus halepensis (Aleppo pine) is an endemic species grown in the Mediterranean countries. The present study aims to investigate the differences of physicochemical composition of *Pinus halepensis* seed oils obtained from Algerian and Turkish varieties by solvent maceration (hexane) and cold pressing techniques. Refractive indices of the oils ranged from 1.4491 to 1.4584. The acid values of the oils were found between 0.07–0.22% oleic acid and significantly ($p < 0.05$) affected by origin of the seeds. Iodine and peroxide values ranged between 105.85–124.52 g/100g and 0.99–6.85 meq O₂/kg, respectively. Interaction between origin and oil extraction method significantly ($p < 0.05$) affected these two values. On the other side, only oil extraction method had a statistically significant ($p < 0.05$) effect on K232 values. In general, solvent-extracted seed oils had higher K232 values than cold-pressed ones in this study. Total carotenoids, total chlorophylls contents and total antioxidant activities ranged between 0.81–1.36 mg lutein/kg, 2.35–3.43 mg pheophytine a/kg, and 17.25–26.94 mM Trolox equivalent/kg, respectively. All these parameters were significantly ($p < 0.05$) affected by origin × oil extraction method interaction. Cold-pressed *Pinus halepensis* seed oils had significantly ($p < 0.05$) higher total phenolic contents than solvent-extracted oils. *Pinus halepensis* seed oils were majorly consisted of linoleic, and oleic acids. The highest contents of linoleic acid were found in cold pressed oils (58.41–57.87%), while the lowest contents were found in hexane-extracted oils (56.64–56.81%) of Algerian and Turkish seed varieties, respectively. The results of this study suggest that *Pinus halepensis* seeds can be considered as a good source of high-quality oil. It could be economically used as valuable natural products for industrial, cosmetic and phytotherapy uses.

Keywords: chemical characteristics, cold pressing, *pinus halepensis*, solvent maceration

(28028) BIOACTIVE COMPOUNDS OF *Camelina sativa*

*Kinga Stuper-Szablewska*¹, *Danuta Kurasiak-Popowska*¹

¹ *Poznan University of Life Sciences, Poland*

danuta.kurasiak-popowska@up.poznan.pl

Camelina sativa is an oilseed plant from seeds which produces oil rich in vitamins, UFA, phenolic compounds (including phenolic acids and flavonoids), tocopherols, phytosterols, carotenoid pigments and phospholipids. The increasing interest in camelina oil results from the fact that it contains large amounts of essential unsaturated fatty acids (EUFA), i.e. ω -6 fatty acid (linoleic acid) and ω -3 fatty acid (linolenic acid). In 2006 camelina oil was registered as a traditional product in Greater Poland Voivodeship. It is produced only by pressing at low temperatures and it can be consumed as unrefined oil. At present there is increasing interest in *Camelina sativa* due to its resistance to unfavourable soil and climatic conditions as well as its high resistance to diseases and pests. Research on the production of oil from other camelina cultivars than the ones which have been grown in Poland so far is justified by the fact that pilot experiments proved significant differences in the content of bioactive compounds between spring and winter cultivars and within these two types. The aim of this study was to determine the qualitative and quantitative profiles of bioactive compounds in camelina seeds. However, there were differences in the content of these compounds between the spring and winter cultivars. The spring genotypes had lower content of the bioactive compounds than the winter genotypes. The winter genotypes were characterised by higher content of essential unsaturated fatty acids (UFA) than the spring forms. The spring forms were more abundant in eicosenoic acid (C20:1). Camelina's adaptation to vast areas of the world, high oil content combined with its unique oil composition and properties makes it a suitable oil source for the production of biofuels, jet fuel, biobased-products, feed, and food. Camelina could become an important plant for obtaining oil rich in antioxidant bioactive compounds and sustainable source of omega-3 acids.

Keywords: *Camelina sativa*, phenolic compounds, essential unsaturated fatty acids

(28218) BIOACTIVE PEPTIDES FROM OILSEED MEALS

Recep Palamutoglu¹, Cemal Kasnak¹

¹ Afyonkarahisar Health Science University, Turkey

recepalamutoglu@hotmail.com

Oilseed meals contain high amount of proteins, fibers, and phenolic compounds. These compounds are used with different purposes in food industry. Consumer trends show that healthy and functional foods have been requested. So oilseed meals are the potential sources of this compounds which have positive effects on human health. Especially bioactive peptides have different bioactive effects such as antioxidant, antihypertensive, antimicrobial, anticancer, anti-inflammatory, immunomodulatory, opioid etc. In the parent molecule peptides are not active and specific peptides can be released during gastrointestinal (GI) digestion, hydrolysis by proteolytic microorganisms and through the action of proteolytic enzymes derived from microorganisms or plants and food processing. In this study, release mechanisms of bioactive peptides from oilseed meals and bioactivities of peptides will be reviewed.

Keywords: Bioactive, Oilseed, Peptides

(28476) A PROMISING NATURAL EMULSIFIER DERIVED FROM INDUSTRIAL BY-PRODUCT BLACK CUMIN SEED CAKE

Bengu Ozturk¹, Elif Taban¹

¹ *Yeditepe University, Turkey*

benguozturk@gmail.com

This study was carried out to investigate the emulsifying properties of a natural plant protein concentrate obtained from an industrial by product black cumin seed cake. Isoelectric precipitation method was applied for the production of protein concentrate from the industrial by product. Soluble protein content in the black cumin seed cake protein concentrate (BCPC) was determined using BSA method. Physicochemical (zeta potential (ζ -potential), protein solubility (PS)) and emulsifying (droplet size, emulsifying activity (EAI), and stability (ESI) indices) properties of BCPC were investigated and compared to commercial milk proteins, WPC, WPI and casein. Protein content in the black cumin seed cake concentrate was analyzed by Kjeldahl method and found as 64.58 ± 0.11 % (w/w) and soluble protein content in the protein concentrate was 4.14 ± 0.43 % (w/w). Emulsions (10%w/w corn oil and 90%w/w 10 mM Na-phosphate buffer, pH 7.0) stabilized by different emulsifiers were produced by high speed homogenizer Ultra Turrax IKA T18 at 15000 rpm for 2 min. Emulsions with 0.5 % (w/w) BCPC had a zeta potential value of -33 ± 2 mV and particle size of 676 ± 124 nm which showed significant difference with casein stabilized emulsions ($p < 0.05$). Emulsifying activity index (EAI) of BCPC ($152 \text{ m}^2/\text{g}$) was significantly higher than the milk proteins ($p < 0.05$). Emulsifying stability index (ESI) of BCPC (192 ± 35 min) was similar to WPC (178 ± 28 min) but higher than WPI and casein which showed that BCPC had good emulsifying ability and stabilizing property so that it can be regarded as a promising emulsifier for the use in several sectors. This study revealed that a high added value food ingredient can be obtained from an industrial by product by chemical methods. Black cumin protein with good emulsifying properties can be a natural alternative to various emulsifiers used in the food industry.

Keywords: black cumin seed cake protein, industrial by-product, isoelectric precipitation, emulsifying properties, natural emulsifier

(28025) POLYUNSATURATED FATTY ACIDS FROM RAPESEED SEEDS

*Epure Doru-Gabriel*¹, *Enascuta Cristina*², *Oprescu Elena-Emilia*³, *Gidea Mihai*⁴,
*Niculescu Mihaela*⁵

¹ *Sc Probstdorfer Saatzucht Romania Srl, Bucharest, Romania*

² *National Institute for Research & Development In Chemistry and Petrochemistry, Icechim,
Bucharest, Romania*

³ *National Research and Development Institute for Chemistry and Petrochemistry, Icechim
Bucharest, Romania*

⁴ *University of Agronomic Sciences and Veterinary Medicine, Bucharest, Romania*

⁵ *National Research and Development Institute for Textiles and Leather, Bucharest, Romania*

cristina.enascuta@gmail.com

In human diet a essential role in optimal brain functions and stroke prevention it has polyunsaturated fatty acids (PUFA), specially, omega-3 fatty acids, e.g. 9,12,15-linolenic acid (ALA, 18:3), 5,8,11,14,17-eicosapentaenoic acid (EPA, 20:5) and 4,7,10,13,16,19-docosahexaenoic acid (DHA, 22:6). The rich sources in this type of acids are vegetable seeds like rapeseed, hemp, flax, camelina and ocean fish oils. Global rapeseed production has a sustained growth over the last years. Rapeseed is primarily grown for meal and its oil, which can be further processed. In this context, due to their rich content in polyunsaturated fatty acids (PUFA), rapeseed oils, can be transformed in their alkyl esters by transesterification, through one or two stages. PUFA have been prepared by extraction of triglycerides from seeds, followed by transesterification with ethanol over basic catalysts and purification. A few homogeneous and heterogeneous catalysts will be tested. The analysis of polyunsaturated fatty acid ethyl esters was performed using GC-MS/MS TRIPLE QUAD (Agilent 7890 A). Fatty acid ethyl esters have been synthesized in order to be enriched in PUFA by molecular distillation.

Keywords: rapeseed, transesterification, molecular distillation

**(27907) EXTRACTION, PROCESSING AND FUNCTIONAL PROPERTIES OF
BLACK CUMIN SEED OIL**

Turkan Mutlu Keceli

University of Cukurova, Turkey

turkankecelimutlu@gmail.com

Black cumin seed oil is getting an attention worldwide due to the health benefits associated to its consumption. It contains 34–39% of oil. Black cumin seed oil is getting much attention either used alone or in combination with other vegetable oils. Oil extraction from raw or roasted black seeds is generally performed by pressing or using a solvent such as hexane. Among these, cold pressed extraction has been widely studied as it allows the production of high quality oils. This virgin oil obtained can be consumed directly without the need to apply a refining process. Black cumin seed oil is characterized by high amount of essential fatty acids, tocopherols and sterols and other minor components that contribute to its high antioxidant capacity, oxidative stability, and special flavor and color. Black cumin seed oil is a significant source of essential fatty acids, tocopherols (91–246 ppm), phytosterols (1993–2182 ppm), polyphenols (245–309 ppm), essential oils and other bioactive compounds. Thymoquinone is one of the important active compounds in the essential oil part of black seed oil with many health beneficial properties. Composition and functional properties of black seed oil make it a great potential new multi-purpose product for industrial, nutritional, cosmetic and pharmaceutical uses. Black seed oil seems to be a good source of essential fatty acids and lipid-soluble bioactive compounds. The high linoleic and oleic acid contents and the considerable amounts of natural antioxidants such as polyphenolic, tocopherol and thymoquinone content make this oil nutritious and capable of being conserved safely for a long time.

Keywords: Blackcumin seed oil, extraction methods, Processing conditions, Functional Properties, Biochemical properties, Quality.

**(26712) CHARACTERIZATION OF THREE FOOD OILS OF ALGERIAN,
TUNISIAN AND IVORIAN ORIGIN**

Mahi Zineb¹, Niangaly Djeneba¹, Niangaly Djeneba¹

¹ *Oran University (USTO), Algeria*

z.mahiman@gmail.com

Lipids or fats occupy a very important place in the human nutrition. They are essential for the proper functioning of the body and provide a greater amount of energy than that provided by carbohydrates. These lipids differ according to their physicochemical characteristics, their mode of manufacture, their composition in fatty acids, vitamins, minor compounds, their nutritional interest and their uses. Three varieties of food oil were selected: Afia oil a blend of (95% soybean and 5% maize), Dinor oil extracted from the fruit pulp of the oil palm and EL MANAR oil a vegetable oil extracted from olives. The analytical control is based on the determination of the quality characteristics: Refractive index, relative density, Saponification index, Unsaponifiable matter content as well as the deterioration characteristics: acid and peroxide indices of the oils. The results obtained, compared to the standards of the Codex Alimentarius, clearly shows that the three oils are not in conformity. Tunisian oil is the worst in terms of its peroxide index far removed from international standards.

Keywords: Vegetable oil, Peroxide index, Deterioration.

**(26941) SENSORY AND FUNCTIONAL CHARACTERISTICS OF OLIVE OILS
OBTAINED BY CROSSING OF ASCOLANA WITH KARAMURSELSU,
TAVSANYUREGI AND USLU CULTIVARS**

Yasin Ozdemir¹, Nesrin Aktepe Tangu¹, Hakan Yavas²

¹ *Ataturk Central Horticultural Research Institute, Yalova, Turkey*

² *Central Research Institute of Food and Feed Control, Bursa, Turkey*

gidaciyasin@hotmail.com

This research was done in the context of Oil Property Determination of Some Hybrid Olive Types Project was supported by Turkey Food Agriculture and Livestock Ministry. This research is aimed to determine sensory, functional and nutrient characters of olive oils of 5 cultivar candidates obtained by cross breeding of Ascolana with Karamürselu, Tavşanyuregi and Uslu cultivars. Maturation index of their fruits and alpha tocopherol, fatty acid and total phenol content and total antioxidant activity of their oils were evaluated. Results of this study showed that it is possible to develop and register new olive varieties which have olive oils with improved functional characters. Olive oils of Ascolana x Karamürselu and Ascolana x Uslu had high antioxidant activity and promising fatty acid composition thus they could be advised to enrich diet and for the preparation of functional food.

Keywords: functional olive oil, olive crossing, olive genotype, tocopherol

(28215) FATTY ACID COMPOSITION OF BLUE, WHITE, AND YELLOW POPPY SEEDS AND THEIR COMPARISON WITH SOME OTHER SEEDS

Cemal Kasnak¹, Recep Palamutoglu¹

¹ Afyonkarahisar Health Science University, Turkey

ckasnak@gmail.com

Poppy (*Papaver somniferum*) is one of the oldest medicinal plants known. Poppy seed is characterized by 45 to 55 percent fat and 30 percent protein content. Turkey's Aegean and Central Anatolian region, most particularly Afyonkarahisar, including Denizli, Konya, Istanbul and Burdur is grown in the provinces. In Turkey, the most widely produced yellow, white, and blue seed poppy varieties. We think that poppy oil can be an alternative consumption against other oils. Therefore we investigated the chemical composition of yellow white and blue seed poppy oil and its comparison with some other oil seeds. The seeds were also compared for antioxidant content.

Keywords: Fatty acid, Poppy oil, Antioxidant capacity

(26713) MINERAL NUTRITION AND LIPIDS IN *CHENOPODIACEAE*

Zineb Mahi¹

¹ Oran University (USTO), Algeria

z.mahiman@gmail.com

The physiological adaptation of the Chenopodiaceae species is correlated with a physiological adaptation. Indeed, several species of this family are characterized by a C4 photosynthetic pathway. The aim of this work is to evaluate the lipid structure of two plant species of the genus *Atriplex* (*halimus* and *canescens*) in order to elucidate the effect of mineral nutrition on lipid peroxidation. Thus, the effect of two concentrations of Na Cl (100, 300 and 600 mMl-1) was studied at the level of the three organs (roots, stems and leaves) through the assay of malondialdehyde (MDA) which represents a bio marker of lipid destruction. The results show variability in the accumulation of MDA which indicate the variability of inter and intra specific responses. Nevertheless, the integrity of membrane lipids is little affected in both species and more in *Atriplex halimus* L.

Keywords: Mineral nutrition, membrane lipids, Malondialdehyde

(28100) ROSEMARY ESSENTIAL OIL AND MICROENCAPSULATION

Cemal Kasnak¹, Recep Palamutoglu¹

¹ *Afyonkarahisar Health Science University, Turkey*

ckasnak@gmail.com

Rosemary (*Rosmarinus officinalis*) is a valuable plant species that always remains green, a needle-like, thin-leaved plant of the family *Lamiaceae*. Rosemary extract has contain rosmarinic acid, camphor, caffeic acid, ursolic acid, betulinic acid, carnosic acid, and there are phytochemicals such as carnosol. The main components of rosemary essential oil are 1,8-cineole, α -pinene, camphor, camphene, borneol, piperitone, linalol. Rosemary essential oil contains 10–20% camphor. Rosemary essential oil is sensitive to light and oxygen. The shelf life of this valuable oil can be increased by using the microencapsulation technique. Microencapsulation is a technology used to obtain a microcapsule by wrapping the surrounding of an active substance with one or more coating materials. It is important to delay the volatility of the essential oils by coating them with a layer and thus to protect the components contained therein. This is due to the fact that the micro-capsule form essential oils exhibit less interaction with other components in the food, show stability for a longer period of time and also increase the effectiveness of antioxidant essential oils by converting them into microcapsule form. In our study, coating materials and techniques that can be used in microencapsulation of rosemary essential oil were investigated.

Keywords: Microencapsulation, Rosemary Essential Oil, Spray drying, Wall material

(28315) RAPESEED AS A SOURCE OF VEGETABLE PROTEIN IN UKRAINE

*Mykola Mykytyn*¹, *Oleksandra Volchovska-Kozak*²

¹ *Prekarpathian State Agricultural Research Station of The National Academy of Agrarian Sciences of Ukraine, Ukraine*

² *Vasyl Stefanyk Prekarpathian National University, Ukraine*

tara_ram@ukr.net

Oil meals are an important source of protein for animal diets. High feed value, all-year availability and competitive price of these feed components caused a steady increase in their production and use. In recent years, oil meals constitute about 1/3 of the total production of the forage crops in the European Community and are the basis of protein animal feeds in the advanced countries, which, mostly due to this fact, provide the high growth rates of productivity in animal breeding and poultry farming. Eight products dominate in the world production and trade of oil meals. They are soybean (63.4%), rape (10.7%), cotton (7.1%), sunflower (5.3%), peanut (3.7%), palm (2.0%), coconut (1.1%), and linseed (0.6%) oil meal. The role of price leader in the international trade belongs to soybean oil meal, which quantity is 1.5 times more than the following peanut oil meal and is 3 times more than sunflower one, in particular. The use of oil meals in animal feeding is restricted not only by their prices but also by a feed value of protein for animals. The feed value is mainly determined by digestion of protein and limitation of a share of oil meal in the diets of different animals. Thus, soybean oil meal is used for feeding the cattle stock, pigs and poultry in the EU member-states. Due to high feed value, the oil meal almost does not have any feeding limitations, so its cost determines a share of oil meal in the diet. Rapeseed meal of "00"-quality is used for feeding cattle stock up to 25%, broilers 2-3%, pigs up to 6%. At the same time, we cannot use rapeseed meal with a high content of glucosinolates (the old varieties from India and China) for feeding pigs and poultry in the amount exceeding 2% of the mass of the diet. Due to high fiber content, the EU member-states mainly use sunflower oil meal for feeding the cattle stock (up to 10%), avoiding its introduction in the diets of poultry and restricting in the diets of pigs 5%. As gossypol is present in cotton oil meal, it is limited in feeding cattle stock by 15-20%. Aflatoxin contamination has reduced the use of peanut oil meal, which is restricted up to 10% in feeding cattle stock. The EU member-states also use palm and coconut oil meal for feeding cattle stock only, introducing them in diets up to 15% and up to 5% respectively. Because of the relatively high price, the EU member-states use linseed oil meal for feeding calves up to 15-20%. Due to imperfect patterns of oilseed and grain crops as well as due to inadequate export policy, oil meals are produced by 2.5-3 times less than the animal breeding demands in the internal market of Ukraine. This is even though the areas with sunflower, the main oil-protein crop, exceed scientifically based standard more than doubled. In this regard, we have to expand the areas and production of such crops like soybean and rape significantly. In relation to the abovementioned, there is a steady tendency to expand the areas with rape in Ukraine. Thus, while in 2000 these areas averaged 300-400 thousand hectares, then in 2011 -2017 they were 500-800 hectares and in 2018-2019 the areas take over 1 million hectares. Increase in cultivation areas with rape up to 1.5 million hectares will give us the possibility to yield about 2.0 million tons of oil meal to balance nearly 20 million tons of concentrated feeding stuff.

Keywords: Rapeseed, Oil, Meal, Protein, Feeding

(27911) NEAR INFRARED (NIR) SPECTROSCOPY APPLICATIONS IN OILS AND FATS

Turkan Mutlu Keceli

University of Cukurova, Turkey

turkankecelimutlu@gmail.com

Near infrared (NIR) spectroscopy, based on the absorption of electromagnetic radiation at wavelengths in the range 780–2500 nm, provides an alternative, non-destructive and rapid technology applied increasingly for determination of food constituents in recent years. NIR has various advantages compared with traditional methods such as chemical-free, low cost, determination of numerous constituents as simultaneous and very fast (15-90 s), availability of samples for further analysis after the measurement with NIR, requiring a relatively less amount of sample. Therefore, NIR spectroscopy can be used for routine analysis of vegetable oils, as well as for determination of origin and adulteration. NIR spectroscopy can be used for the determination of moisture, fat, FA content and other parameters are currently available. Due to these advantages of NIR spectroscopy, it is anticipated that it will be widely used especially in the analysis of vegetable oils and production line applications. In recent decades, NIR spectroscopy combined with chemometrics has become one of the most attractive analytical techniques with which to achieve these aims. In order to obtain reliable and efficient quantitative and qualitative models, several fundamental aspects sampling, reference analysis, splitting data, pretreatment an optimum data such as variable selection, validation and choice of classification or regression method have to be taken into account: In this study, historical developing, theory, advantages/ disadvantages, available applications and oil field applications of near infrared spectroscopy for foods have been reviewed.

Keywords: NIR, authentication, chemometric techniques, quality, adulteration determination

(27928) INVESTIGATION OF THE DISPERSION OF SYNTHESIZED MN- AND CO-CONTAINING NANOCATALYSTS IN OIL CONCENTRATE

Aygun Aliyeva¹

¹ *National Academy of Sciences of Azerbaijan, Institute of Petrochemical Processes, Baku, Azerbaijan*

aygunphd@gmail.com

The high electrophilicity of the surface of fullerenes, carbon nanotubes and nanofibers is explained by the presence of weak π -bonds on their surface, which are formed by the free electrons present on the surface of the nanostructure. During long storage, these substances agglomerate due to the breaking of weak π -bonds, which creates problems in their use in various catalytic medium. Therefore, it becomes necessary to deagglomerate these substances before using them in chemical reactions as a catalyst. A ultrasonic cavitation (UT) effect can be used to deagglomerate carbon nanostructures. Under ultrasonic testing, the formation of cavitation vibrations and collapsing cavitation bubbles begins to occur, which contribute to the dispersion of particles, that is, the destruction of the agglomerated bonds of carbon nanoparticles in the oil concentrate. Mn and Co-containing catalysts (MnOx / C, CoOx / C) were synthesized from the salt of natural petroleum acids (NPA), with their further processing on the CVD-753 unit according to the procedure [1]. The elemental, phase compositions of the synthesized nanocatalysts were studied by the methods of elemental and X-ray analyzes, the results of which indicate the presence of oxygen in the catalyst, due to the formation of metal oxides. However, the data also suggests that the available oxygen in the system is not sufficient for oxidation, for example, of all manganese in MnO (55: 16 > 17.5: 7.25), and manganese not bound to oxides is likely to stabilize as carbide. From the histograms of dynamic light scattering of samples, it follows that the catalyst studied does not dissolve in the reaction medium, and the catalytic system consists of a dispersed medium with catalyst particles, the “hydrodynamic diameter” of which is in the range from 0.5 to 1.3 μm . In the control sample of the composition, the distribution of particles is in the range of 850-1250 nm, and after the ultrasonic impact test, the particles are displaced from 100 to 1000 nm, which generally characterizes the ability of the ultrasonic inspection to activate the dispersion of agglomerates in a liquid medium.

Keywords: carbon nanoparticle, Mn & Co containing nanocatalysts, ultrasonic cavitation, CVD

(28082) SESAME SEED OIL AS A SOURCE OF SUSTAINABLE PRODUCTS FOR PHYTOPARASITIC NEMATODE MANAGEMENT

Trifone D'addabbo¹, Fabio Catalano¹, Nicola Sasanelli¹

¹ *Institute for Sustainable Plant Protection (CNR), Italy*

nicola.sasanelli@ipsp.cnr.it

The growing need of a higher sustainability of agricultural products is more and more imposing the search of alternatives to synthetic pesticides for the control of crop parasites and pathogens. In this work, the effectiveness of an industrial formulate of sesame oil was assessed either in pot and in a commercial greenhouse against the root knot nematode *Meloidogyne incognita* on tomato. In the pot experiment, the sesame oil product was applied at three single dosages at tomato transplant, whereas in the experiment in commercial greenhouse treatments at transplant and during the crop cycle were provided either alone or combined with a seedling root dipping treatment. In both experiments, the nematicidal efficacy of sesame oil formulate was evaluated in comparison to two alternative non chemical products based on quillay extract and neem azadiractin as well as to the synthetic nematicide fenamiphos. In the experiment in pot, treatments with the sesame oil product suppressed *M. incognita* population and gall formation on tomato roots at the same levels of the treatment with phenamiphos, significantly improving plant growth at the same time. In the commercial greenhouse, all treatments with the sesame oil formulate significantly reduced nematode multiplication and root galling compared to the non-infested control and treatments with quillay and neem products and with no statistical difference from fenamiphos. Moreover, some combined applications of the sesame oil products resulted also in a tomato yield significantly larger than both nontreated control and treatments with the quillay and neem derivatives. Data from these experiments seem to indicate the sesame oil as an effective source of environmentally safe nematicides.

Keywords: Root-knot nematodes, Seed Oils, Sustainable Control

(28551) DETERMINATION OF OIL RATIO OF POPPY (PAPAVER SOMNIFERUM L.) LINES WITH DIFFERENT SEED COLORS

Yasin Özgen, Nilgün Bayraktar

Ankara University Agriculture Faculty, Field Crops Department, Ankara, Turkey

yozen@ankara.edu.tr

This experiment was carried out as a winter in 2016-17 and 2017-18 in Ankara University Faculty of Agriculture Department of Field Crops. The experiment was established on a total area of approximately 150 m² with 4 replications, 4 rows, 2 m row length, 30 cm above row, 10 cm above row according to the Randomized Blocks Experimental Design. 23 high-morphine lines with different seed colors were used in the poppy seed collection. These lines have 5 blue, 5 white, 5 yellow, 4 pink and 4 gray colored seeds. The data were evaluated in Mstat-C program and Duncan groupings were performed. According to the results of the research; morphine ratio is 0.957-1.405% and the fat ratio is 39.03-48.7%. The morphine content of the lines is between blue 1,225-1,405%, white 1,213-1,303%, yellow 1,215-1,277%, pink 0.957-1,1257%, gray 1,099-1,178% according to seed color. Oil ratio according to seed color; yellow between 45.6-48.7%, white 43.5-46.2%, blue 41.2-44.6%, pink 40.1-44.4% and gray 40.3-41.9% changed. It has been determined that the results of the blue poppy lines in terms of morphine ratio and yellow poppy lines in terms of oil ratio are superior to other seed colors.

Keywords : Poppy, Morphine, Oil content, Seed

(28552) DETERMINATION OF OIL RATIO OF SEEDS OF DIFFERENT NIGELLA (NIGELLA SP.) SPECIES ACCORDING TO SOWING TIMES

Yasin Özgen, Nilgün Bayraktar

Ankara University Agriculture Faculty, Field Crops Department, Ankara, Turkey

yozen@ankara.edu.tr

This study was conducted as a winter and summer planting in the experimental field of Department of Field Crops, Faculty of Agriculture, University of Ankara in 2017-18. Seed sowing of lines According to Randomized Blocks Experimental Design, 4 repetitions, 2 rows, 2 m row length and 40 cm row were established on a total of approximately 80 m². In the experiment, black seed seed collection; Lines of 3 *Nigella damascena* L., 4 *Nigella arvensis* L. and 7 *Nigella sativa* L. species were used. The results obtained in the experiment were evaluated in the MSTAT-C program and Duncan groupings were performed. In the study; plant height, number of capsules and seed yield averages, *Nigella sativa* lines and sowing in winter in terms of statistical significance was 1%. According to the average results of the lines, the rate of oil in summer plantings was higher than in winter. Oil ratios of species in the experiment; *Nigella sativa* ranged between 39.7-46.6%, *Nigella arvensis* 30.6-38.7%, *Nigella damascena* between 28.1-35.3%. The change in oil ratio was mostly in *Nigella sativa* species and in summer in sowing.

Keywords : Oil Content, *Nigella sativa* L., Seed, Sowing Time

PARTICIPANT LIST

#	Name	e mail	COUNTRY
1	Jerina Kolitari	j.kolitari@gmail.com	Albania
2	Ahmed Boukeloua	ahmedcte@yahoo.fr	Algeria
3	Labdelli Amina	aminalabdelli@yahoo.fr	Algeria
4	Azi Mouna	azimouna1982@gmail.com	Algeria
5	Bachra Khettal	bachra_khettal@yahoo.fr	Algeria
6	Badis Abdelmalek	badisabdelmalek@yahoo.fr	Algeria
7	Benkenana Naima	benkenana@yahoo.co.nz	Algeria
8	Bouatrous Yamina	bouatrousyamina@yahoo.fr	Algeria
9	Chebouti-Meziou Nadjiba	chnadjiba@yahoo.fr	Algeria
10	Diaf Mustapha	diafmustapha@gmail.com	Algeria
11	Miloud Hafsi	hafsimiloud@gmail.com	Algeria
12	Nabila G. Khoulood Baya	khood_alg@yahoo.com	Algeria
13	Ouardia Ouldali Ouldali	oouldali@yahoo.fr	Algeria
14	Aichour Ridha	ridha_aichour@yahoo.ca	Algeria
15	Sihem Ait Atmane	sihemaitatmane@yahoo.com	Algeria
16	Tabet Derraz Souhila	sous.tabet95@gmail.com	Algeria
17	Tebboune Leyla	w.djohra@gmail.com	Algeria
18	Mahi Zineb	z.mahiman@gmail.com	Algeria
19	Aygun Aliyeva	aygunphd@gmail.com	Azerbaijan
20	Cingiz Aeliyev	metanetpenahova20@gmail.com	Azerbaijan
21	M. Abul Kalam Azad	makazad.pdbina@gmail.com	Bangladesh
22	Krsto Mijanović Mijanović	krsto.mijanovic@unmo.ba	Bosnia Herzegovina
23	Anyo Mitkov	anyomitkov@abv.bg	Bulgaria
24	Mariyan Yanev	marlanski@abv.bg	Bulgaria
25	Nesho Neshev	n_neshev85@abv.bg	Bulgaria
26	Nina Nenova	nina_n13@abv.bg	Bulgaria
27	Tonyo Tonev	tonytonev@abv.bg	Bulgaria
28	Daniela Valkova	valkova_d@abv.bg	Bulgaria
29	Zeeshan Ahmad	zeeshanagronomist@yahoo.com	China
30	Niangaly Djeneba	dniangaly@yahoo.fr	Cote D'ivoire
31	Khaked Elgendy	elgendykh64@gmail.com	Egypt
32	Birhanu Gameda Gato	birhanubio@hotmail.com	Ethiopia
33	Mahendra Singh Pal	drmspal1@gmail.com	India
34	Zaki Muhammad Bagas	bagaszakim@gmail.com	Indonesia
35	Zaki Muhammad Bagas	bagaszzakim@gmail.com	Indonesia
36	Fabio Catalano	fabio.catalano@ips.cnr.it	Italy
37	Nicola Sasanelli	nicola.sasanelli@ips.cnr.it	Italy
38	Trifone D'addabbo	trifone.daddabbo@ips.cnr.it	Italy
39	Myung-Chul Lee	mcleekor@korea.kr	Korea Republic
40	Zoran Dimov	dimov632002@yahoo.co.uk	Macedonia
41	Ile Canev	icanev@gmail.com	Macedonia

42	Igor Iljovski	iljovski2@yahoo.com	Macedonia
43	Romina Kabranova	rkabranova@yahoo.co.uk	Macedonia
44	Romina Kabranova	romina@fznh.ukim.edu.mk	Macedonia
45	Abdelghani Nabloussi	abdelghani.nabloussi@gmail.com	Morocco
46	Abderrazzak Bendidi	abendidi1@yahoo.fr	Morocco
47	Mohamed Fechtali	fechtali.mohamed@gmail.com	Morocco
48	Hafid Ibriz	ibrizhafid@yahoo.fr	Morocco
49	Dickson Junior Nwosu	dicksonnwosu@gmail.com	Nigeria
50	Emmanuel Okoronkwo	emmanuelokoronkwo0@gmail.com	Nigeria
51	Benson Apuyor	fitzapuyor@yahoo.com	Nigeria
52	Jude Mbanasor	judembanasor@gmail.com	Nigeria
53	Michael Adedotun Oke	maof2020@gmail.com	Nigeria
54	Mayowa Olubiyi	mayoraph@yahoo.com	Nigeria
55	Vincent Eze	mekus2020@gmail.com	Nigeria
56	Chigozirim Onwusiribe	ndubuisichigo@gmail.com	Nigeria
57	Iwoh Ekerette	okoronkwoemma@rocketmail.com	Nigeria
58	Sunday Aladele	saladele6083@gmail.com	Nigeria
59	Fozia Abasi	abasifozia@gmail.com	Pakistan
60	Mubasher Ahmad Malik	ahmadmubasher49@gmail.com	Pakistan
61	Kanita Shah	alinawazgcu@gmail.com	Pakistan
62	Ali Nawaz	alinawazgcu@yahoo.com	Pakistan
63	Asghar Ali	asgharali_phb@pakhibred.com	Pakistan
64	Ahmad Shoeb Tahir Mr	astahir@gmail.com	Pakistan
65	Muhammad Bilal Dr	bilaladams@gmail.com	Pakistan
66	Ikram Haq	dr.ikramulhaq@gcu.edu.pk	Pakistan
67	Hafeez Ahmad Sadaqat	drhafeezsadaqat@yahoo.com	Pakistan
68	Fayyaz Ahmad Mr	fayyazro@yahoo.com	Pakistan
69	Hamid Mukhtar	hamidwaseer@yahoo.com	Pakistan
70	Muhammad H. N.Tahir	hammad.nadeem@mnsuam.edu.pk	Pakistan
71	Hina Saleem Saleem	hinah3099@gmail.com	Pakistan
72	Humera Razzaq	humerarazzaq@gmail.com	Pakistan
73	Jam Nazeer Ahmad	jamnazireeahmd@yahoo.com	Pakistan
74	Mahmood Ul Hassan	mhj407jb@yahoo.com	Pakistan
75	Zahra Mubeen	mubeenzahra77@gmail.com	Pakistan
76	Ali Liaqat	phlaid@liaqatcorp.com	Pakistan
77	M. Saeed Rauf	saeedbreeder@yahoo.com	Pakistan
78	Samina Jam N. Ahmad	saminatmalik@yahoo.com	Pakistan
79	Sanam Bashir Khan	seenasweet89@hotmail.com	Pakistan
80	Nasir Ali Tauqir Dr	tauqir041@hotmail.com	Pakistan
81	Ejaz Waraich	uaf_ewarraich@yahoo.com	Pakistan
82	Rashid Ahmad	uaf_rashid@yahoo.com	Pakistan
83	Uzma Ayaz Khan	uzma_ayaz89@hotmail.com	Pakistan
84	Zahoor Ahmad	zahoorbhp@yhao.com	Pakistan
85	Danuta Kurasiak-Popowska	danuta.kurasiak-popowska@up.poznan.pl	Poland

86	Kinga Stuper-Szablewska	kinga.stuper@up.poznan.pl	Poland
87	Tomasz Wolak	twolak@steqtech.com	Poland
88	Enascuta Cristina	cristina.enascuta@gmail.com	Romania
89	Epure Doru-Gabriel	doru.epure@prostdorfer.ro	Romania
90	Gidea Mihai	gideam@yahoo.com	Romania
91	Niculescu Mihaela	mihaelaniculescu59@yahoo.com	Romania
92	Oprescu Elena-Emilia	oprescuemilia@gmail.com	Romania
93	Nina Konkova	ninakonkova.1@mail.ru	Russian Federation
94	Elena Hájeková	elena.hajekova@stuba.sk	Slovakia
95	Katarína Matúšková	katarina.matuskova@nppc.sk	Slovakia
96	Ľudmila Joríková	ludmila.jorikova@vurup.sk	Slovakia
97	Petra Ondrejčíková	ondrejickova@enviengroup.eu	Slovakia
98	Peter Hozlar	peter.hozlar@nppc.sk	Slovakia
99	Mohammad H. Alanbari	alanbari@universidadeuropea.es	Spain
100	Manuel Falcon	m.falconmartin@strube-research.net	Spain
101	Louai Abdalla Mohammed	aburetaj22@gmail.com	Sudan
102	Yasmin Aburgal	aburigalyasmin@gmail.com	Sudan
103	Aisha Modawi	aiosha25@gmail.com	Sudan
104	Babiker M. Osman	amiradam2@gmail.com	Sudan
105	Abdalla A. A. Mohammed	amirchem22@gmail.com	Sudan
106	Elfadl Elmogtaba	elmogtaba@yahoo.com	Sudan
107	Nada Hamza	nada.hamza@gmail.com	Sudan
108	Awatif Siribel	siribelawatif@yahoo.com	Sudan
109	Ismail Hussein	sunnopri@gmail.com	Sudan
110	Thada Amsungnoen	t.d.thada@gmail.com	Thailand
111	Aygul Dayan	adayan@cu.edu.tr	Turkey
112	Ahmet Cat	ahmetcat@akdeniz.edu.tr	Turkey
113	Ahmet Korhan Sahar	ahmetkorhan.sahar@tarimorman.gov.tr	Turkey
114	Ahmet Yılmaz	ahyil42@hotmail.com	Turkey
115	Begum Kaya	begumkaya22@gmail.com	Turkey
116	Bengu Ozturk	benguozturk@gmail.com	Turkey
117	Bulent Cengiz	bulent.cengiz@tarimorman.gov.tr	Turkey
118	Bulent Uzun	bulentuzun@akdeniz.edu.tr	Turkey
119	Bihter Onat	bzaimoglu@cu.edu.tr	Turkey
120	Cemal Kasnak	ckasnak@gmail.com	Turkey
121	Sibel Day	day@ankara.edu.tr	Turkey
122	Elif Taban	elifftaban@gmail.com	Turkey
123	Emrah Akpınar	emrah.akpinar00@gmail.com	Turkey
124	Erdal Arik	erdal@tnhturizm.com	Turkey
125	Yasin Ozdemir	gidaciyasin@hotmail.com	Turkey
126	Leyla Gulluoglu	gulluoglu@cu.edu.tr	Turkey
127	Hakan Yavas	hakan.yavas@tarim.gov.tr	Turkey
128	Halis Arioglu	harioglu@cu.edu.tr	Turkey
129	Halil Bakal	hbakal@cu.edu.tr	Turkey

130	Abdulhabip Ozel	hozel@harran.edu.tr	Turkey
131	Hasan Vural	hvural@uludag.edu.tr	Turkey
132	Ali Kahraman	kahramanali@selcuk.edu.tr	Turkey
133	Mursel Catal	mcatal@akdeniz.edu.tr	Turkey
134	Mehmet Karakus	mehmet.karakus@tarimorman.gov.tr	Turkey
135	Mehmet Cavit Sezer	mehmetcavit.sezer@tarimorman.gov.tr	Turkey
136	Meltem Posta	meltem-posta@hotmail.com	Turkey
137	Metin Yurdagul	metin.yurdagul@mumsad.org.tr	Turkey
138	Mustafa Onder	monder@selcuk.edu.tr	Turkey
139	Muhammad Aasim	mshazim@gmail.com	Turkey
140	Muzaffer Isik	muzafferisik@bisab.org.tr	Turkey
141	Nilgun Bayraktar	nbayrak@agri.ankara.edu.tr	Turkey
142	Nesrin Aktepe Tangu	nesrinaktepetangu@tarim.gov.tr	Turkey
143	Niyazi Akarken	niyazi.akarken@tarimorman.gov.tr	Turkey
144	Osman Barış Kılınc	osman@bisab.org.tr	Turkey
145	Pinar Cubukcu	pcubukcu@hotmail.com	Turkey
146	Pelin Gunc Ergonul	pelin.ergonul@cbu.edu.tr	Turkey
147	Rahime Cengiz	rcengiz24@gmail.com	Turkey
148	Recep Palamutoglu	receppalamutoglu@hotmail.com	Turkey
149	Rustem Ustun	rustemustun@akdeniz.edu.tr	Turkey
150	Gokhan Sadi	sadi@kmu.edu.tr	Turkey
151	Aziz Tekin	tekin@ankara.edu.tr	Turkey
152	Turkan Mutlu Keceli	turkankecelimutlu@gmail.com	Turkey
153	Umran Akgun Yildirim	umran_akgun@hotmail.com	Turkey
154	Yıldıray Gencer	y.gencer@metgen.com.tr	Turkey
155	Yalcın Kaya	yalcinkaya22@gmail.com	Turkey
156	Yasemin Vurarak	yasemin.vurarak@tarimorman.gov.tr	Turkey
157	Yavuz Agi	yavuz.agi@tarimorman.gov.tr	Turkey
158	Yasin Ozgen	yozen@ankara.edu.tr	Turkey
159	Zeynep Aksoyly Ozbek	zeynepaksoyly@hotmail.com	Turkey
160	Zinnur Gozubuyuk	zgozubuyuk2001@yahoo.com	Turkey
161	Oleg Sukach	19oleg85@ukr.net	Ukraine
162	Andriy Pushak	apushak@gmail.com	Ukraine
163	Yaroslav Blume	cellbio@cellbio.freenet.viaduk.net	Ukraine
164	Dariia Yefanova	efanova.dasha1998@gmail.com	Ukraine
165	Iryna M. Ivashkiv	i.ivach@ukr.net	Ukraine
166	Ihor Yatsiv	igyatsiv@ukr.net	Ukraine
167	Oleksandra Volchovska-Kozak	inst@pu.if.ua	Ukraine
168	Ivanna Sholonkevych	instapv@i.ua	Ukraine
169	Viktor Ivaniuk	ivanukv@gmail.com	Ukraine
170	Yevhen Kalishyn	kalishyn.yevhen@gmail.com	Ukraine
171	Svitlana Hrynkevych	lidersvit@gmail.com	Ukraine
172	Oleksandr Drozd	linumrape@gmail.com	Ukraine
173	Maryana Kohut	maryana_kohut@i.ua	Ukraine

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174	Nataliia Volkova	natavolki@ukr.net	Ukraine
175	Volodymyr Paslavskyi	paslavskiyv@i.ua	Ukraine
176	Roman Shevchuk	rshevchook@i.ua	Ukraine
177	Stepan Myagkota	smyagkota@gmail.com	Ukraine
178	Mykola Mykytyn	tara_ram@ukr.net	Ukraine
179	Tetiana Kyrpa-Nesmiian	t-kirpa@ukr.net	Ukraine
180	Yevhenii Zaika	za-ika@ukr.net	Ukraine
181	Christopher Ridout	christopher.ridout@jic.ac.uk	United Kingdom
182	Hicret Asli Yalcin	hicret.yalcin@jic.ac.uk	United Kingdom
183	Rachel Wells	rachel.wells@jic.ac.uk	United Kingdom
184	Ricardo H. R. Gonzalez	ricardo.ramirez-gonzalez@jic.ac.uk	United Kingdom
185	Bianca Ortega	missybiancas@icloud.com	United States
186	Nurhan Dunford	nurhan.dunford@okstate.edu	United States

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