

# 19<sup>TH</sup> INTERNATIONAL SUNFLOWER CONFERENCE



# isc 2016

29 MAY – 3 JUNE, 2016

EDİRNE, TURKEY





# **ISC 2016**



**PROCEEDINGS  
OF  
19<sup>TH</sup> INTERNATIONAL SUNFLOWER  
CONFERENCE**

**29 MAY – 3 JUNE, 2016**

**EDİRNE, TURKEY**

**19<sup>TH</sup> INTERNATIONAL SUNFLOWER  
CONFERENCE**

**29 MAY – 3 JUNE, 2016,  
EDIRNE, TURKEY**

**In**

**Trakya University Balkan Congress Center,  
Edirne, Turkey**

**Organized by**

**Trakya University**

**and**

**International Sunflower Association**

## **WELCOME from the CHAIR**

You are welcome to our conference that will be jointly organized by Trakya University and International Sunflower Association. The aim of our conference is to present scientific subjects of a broad interest to the sunflower community, by providing an opportunity to present their work as oral or poster presentations that can be of great value for global sunflower production and trade. Our goal is to bring three communities, namely science, research, and private investment together in a friendly environment of Edirne, Turkey in order to share their interests and ideas and to benefit from the interaction with each other.

Our Conference held with record participation with over 600 people working on sunflower as researchers, scientists from seed companies, from oil industry and machinery coming from all part of the World. We have 300 papers which is a record number and almost doubles the previous meetings.

Due to many inquiries about combining our activities with oil industries in ISC 2016, International Sunflower Oil Quality Symposium are organized as one day as a side event during the conference. Sunflower farmers and growers will join also to our conference, so it will be also interesting as an initial attempt to bring together triangle dimensions as scientist, growers and industry in our conference.

Conference activities;

Plenary sessions with oral and poster presentations are on 30<sup>th</sup>, 31<sup>st</sup> of May and 1<sup>st</sup> of June 2016. Besides, the field day and the Sightseeing tours are on June 2<sup>nd</sup> – 3<sup>rd</sup> June 2016.

Agriculture is an important sector feeding all humankind, but it needs new developments and technologies to supply enough food for increasing world population year by year. Turkey is one of the most important contries on sunflower production and trade and an example to the leading agricultural economies in the world. Therefore, we hope that this conference will help to solve the problems encountered in the Sunflower community with establishing good network collaborations, joint projects and better relationships among countries with sharing our knowledge and experience together. We wish success to this meeting and hope a great scientific achievement together with your contributions.

Edirne is not only a very nice, lovely and historical city at the edge of Europe, but located just at the heart of Balkan region and history endowed with monuments reminding imperial past. We are much pleased to host you all in Edirne and in Turkey.

We would like to thank you to join this conference and we would like to give also special thanks our sponsors and collaborators for giving us big supports to organize this event.

We wish you nice stay in Edirne for truly rewarding days.

**Assoc Prof Dr Yalcin KAYA**

**Head of Organizing Committee**

**President of International Sunflower Association**

# ORGANIZING COMMITTEE

## LOCAL ORGANIZING COMMITTEE

Assoc. Prof. Dr. Yalçın KAYA	Trakya University	Head of Organizing Committee
Assist. Prof. Dr. Necmi BESER	Trakya University	Vice Chair of Organizing Commitee
Assoc. Prof. Dr. Semra HASANCEBI	Trakya University	Member
Asst. Prof. Dr. Suleyman KOK	Trakya University	Member
Asst. Prof. Dr. Gokhan KAÇAR	Trakya University	Member
Dr Mehmet YABAS	Trakya University	Member
Emrah AKPINAR	Trakya University	Member
Çağlar ÇOLAK	Trakya University	Member
Zeynep Çisem MUTAFCILAR	Trakya University	Member
Gizem ÇİVİ	Trakya University	Member
Müge Türkoğlu KOÇ	Trakya University	Member
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M. Ibrahim YILMAZ	Trakya Agric. Res Inst	Member
Dr A. Semsettin TAN	Agean Agric. Res Inst	Member
Prof. Dr. Nazan DAGUSTU	Uludağ University	Member
Prof. Dr. Fadul ONEMLI	Namık Kemal University	Member
Asst. Prof. Dr. Orhan Onur ASKIN	Kirklareli University	Member
Dr Vehbi ESER	BISAB	Member
Kamil YILMAZ	TUBID	Member
Yıldıray GENCER	TURKTOB/TSUAB	Member
Dr Mete KÖMEAĞAÇ	TURKTED	Member
Dr. Maria PACUREANU	Fundulea Agric. Res Inst	Member
Assoc. Prof. Dr. Valentina ENCHEVA	Dobroudja Agric. Res Inst	Member
Dr. Vladimir MIKLIC	Novisad Agric. Res Inst.	Member
Dr. Mehmet DEMIRCI	Agrobest	Member
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Ömer IGID	May Seed	Member
Yücel KILIC	Limagrain Seed	Member
Aydın TUNCEL	Pioneer Seed	Member
Abdullah DIŞBUDAK	Soltis Seed	Member
İsmail M. ŞENTÜRK	Syngenta Seed	Member
Yunus YUMUŞAK	Biotek Seed	Member

## **INTERNATIONAL ORGANIZING COMMITTEE**

### **NAME**

### **COUNTRY**

Dr. Felicity VEAR	France
Dr. Andre POUZET	France
Dr. Nikolai BOCHKARYOV	Russia
Dr. Branislav DOZET	Ukraine
Carlos FEOLI	Argentina
Dr Laszlo HARGITAY	Hungary
Dr. Maria JOITA-PACUREANU	Romania
Dr Stevan MASIREVIC	Serbia
Dr. Vladimir MIKLIC	Serbia
Alan SCOTT	Australia
Dr. Gerald SEILER	USA
Prof. Dr. Gian Paolo VANNOZZI	Italy
Dr. Leonardo VELASCO	Spain



# SCIENTIFIC COMMITTEE

NAME	INSTITUTION	COUNTRY	AREA
Dr. Miguel A. CANTAMUTTO	INTA	ARGENTINA	Genetic Resources
Amelia B. B. DE ROMANO	Nidera S. A.	ARGENTINA	Disease Resistance
Dr. Abelardo J. DE LA VEGA	Pioneer Hi-Bred Co.	ARGENTINA	Physiology
Assoc. Prof. Dr. Roumiana VASSILEVSKA-IVANOVA	Inst. of Genetics, Sofia	BULGARIA	Genetic Resources
Dr. Loren RIESEBERG	University Vancouver	CANADA	Genomics
Dr. Nicolas LANGLADE	INRA, Toulouse	FRANCE	Genomics, Drought Resistance
Dr. Stephane MUNOS	INRA, Toulouse	FRANCE	Genomics
Dr. Philippe DEBAEKE	INRA, Toulouse	FRANCE	Agronomy
Dr. Emmanuelle MESTRIES	CETIOM, Toulouse	FRANCE	Disease Resistance
Thierry ANDRÉ	SOLTIS S. A.	FRANCE	Breeding
Sebastian CHATRE	Syngenta S. A.	FRANCE	Breeding
Dr. Sujatha Mulpuri	Direct. of Oilseeds Res.	INDIA	Molecular Breeding
Prof. Dr. Maria DUCA	Moldova Acad. of Sci	MOLDOVA	Orobanche Resistance
Prof. Dr. Gheorghe SIN	Academy for Agric. Sci.	ROMANIA	Agronomy
Dr. Yakov DEMURIN	VNIIMK Krasnodar	RUSSIA	Oil Quality
Dr. Tatyana ANTONOVA	VNIIMK Krasnodar	RUSSIA	Disease Resistance
Dr. Nada HLADNI	IFVC Novi-Sad	SERBIA	Confectionery
Dr. Goran MALIDZA	IFVC Novi-Sad	SERBIA	Herbicide Resistance, Weed Management
Dr. Dragana MILADINOVIC	IFVC Novi-Sad	SERBIA	Molecular Breeding
Dr. Siniša JOCIC	IFVC Novi-Sad	SERBIA	Breeding
Dr. Leire MOLINERO-RUIZ	CSIS Cordoba	SPAIN	Disease Resistance
Prof. Dr. Abdurrahim T. GOKSOY	Uludag University	TURKEY	Breeding
Prof. Dr. Dilek BASALMA	Ankara University	TURKEY	Agronomy
Prof. Dr. Hasan BAYDAR	Süleyman Demirel Univ	TURKEY	Oil Quality
Prof. Dr. Fatih KILLI	Sutcu Imam University	TURKEY	Confectionery
Dr. Nilgün SEZER AKMAN	TSUAB	TURKEY	Seed Certification
Dr. Sami SÜZER	Trakya Agric. Res. Inst	TURKEY	Agronomy
Dr. Walter ANYANGA	Serere Agric. Res. Inst.	UGANDA	Breeding
Dr. Brent HULKE	USDA-ARS Sunflower Research Unit	USA	Breeding
Dr. Lili QI	USDA-ARS Sunflower Research Unit	USA	Molecular Genetics
Dr. Janet KNODEL	North Dakota State Univ.	USA	Sunflower Insects
Dr. Laura MAREK	USDA-ARS Ames, Iowa	USA	Genetic Resources
Dr. Janet KNODEL	North Dakota State Univ.	USA	Sunflower Insects

## **INVITED SPEAKERS of ISC 2016**

### **SESSIONS**

Breeding  
Molecular Breeding  
Agronomy and Seed Production  
Genetic Resources  
Disease & Pest resistance and Management  
Orobanche Resistance and Management  
Abiotic Stress Tolerance and Management  
Herbicide Resistance and Management  
Confectionery

### **SPEAKER**

Dr Branislav DOZET (Hungary)  
Dr. Lili QI (USA)  
Dr Philippe DEBAEKE (France)  
Dr Laura MAREK (USA)  
Prof Dr Steven MASIREVIC (Serbia)  
Dr Maria JOITA-PACUREANU (Romania)  
Dr Nicolas LANGLADE (France)  
Dr Goran MALIDZA (Serbia)  
Dr Nada HLADNI (Serbia)

## **INVITED SPEAKERS of INTERNATIONAL SUNFLOWER OIL QUALITY SYMPOSIUM**

<b>NAME</b>	<b>INSTITUTION</b>	<b>COUNTRY</b>
Prof Dr Nurhan T. DUNFORD	Oklahoma State Univ.	USA
Fabrice THURON	Fat & Associates,	FRANCE
Dr Leanordo VELASCO	CSIC, Cordoba,	SPAIN

### **THE EDITORS OF PROCEEDING BOOK**

Assoc Prof Dr Yalcin KAYA, Assoc Prof Dr Semra HASANCEBI



**SCIENTIFIC COMMITTEE of INTERNATIONAL SUNFLOWER OIL  
QUALITY SYMPOSIUM**

Prof Dr Aziz TEKIN	YABITED, Turkey
Prof Dr Selma TURKAY	Istanbul Technical Univ., Turkey
Prof Dr Aytaç SAYGIN GÜMÜŞKESEN	Ege University, Turkey
Prof. Dr Beraat OZCELIK	Istanbul Technical Univ., Turkey
Prof Dr Enrique M. FORCE	CSIC, Sevilla, Spain
Prof Dr Nurhan T. DUNFORD	Oklahoma State University, USA
Assoc Prof Dr Umit GECGEL	Namik Kemal University, Turkey
Assoc Prof Dr Haci A. GULEC	Trakya University, Turkey
Asst Prof Dr Buket AŞKIN	Kırklareli University, Turkey
Dr Leanordo VELASCO	CSIC, Cordoba, Spain
Dr. Yakov DEMURIN	Vniimk Institute, Russia
Fabrice TURON	Fat & Associates, France
Huseyin BUYUKSAHIN	BYSD, Turkey
Metin YURDAGUL	MUMSAD, Turkey
Suat OZTURK	TYSD, Turkey



**19TH INTERNATIONAL SUNFLOWER CONFERENCE**  
**29 MAY – 3 JUNE, 2016**  
**EDIRNE, TURKEY**

**CONFERENCE PROGRAM**

**GENERAL SESSION**

<b>SUNDAY, MAY 29<sup>th</sup>, 2016</b>	
14 <sup>00</sup> - 20 <sup>30</sup>	<b>Registration at Hotels and Balkan Congress Center</b>
<b>MONDAY, MAY 30<sup>th</sup>, 2016</b>	
08 <sup>30</sup> - 09 <sup>30</sup>	Registration at Balkan Congress Center
09 <sup>30</sup> - 10 <sup>30</sup>	Opening Ceremony Balkan Synphony Orchestra Slide Show: Sunflower from Soil to Table:Our Yellow Bride in the fields Giving Appreciation Certificates to our Sponsors
10 <sup>30</sup> – 11 <sup>00</sup>	Coffee break
11 <sup>00</sup> - 12 <sup>30</sup>	<b>OPENING SESSION:</b> Session Chair: <b>PROF DR MARIA DUCA</b> – Rector of University of Moldova Academy of Science
11 <sup>00</sup> – 11 <sup>40</sup>	<b>Invited Speaker Prof Dr. Dragan Skoric “HISTORY OF SUNFLOWER BREEDING IN THE WORLD”</b>
11 <sup>40</sup> – 12 <sup>20</sup>	<b>Invited Speaker Dr. Lili Qi “MOLECULAR MAPPING OF THE DISEASE RESISTANCE GENES AND ITS IMPACT ON SUNFLOWER BREEDING”</b>
12 <sup>20</sup> – 12 <sup>30</sup>	DISCUSSION
12 <sup>30</sup> – 13 <sup>30</sup>	<b>LUNCH ((Courtesy of Nidera Semillas)</b>

	<b>GENETIC AND BREEDING</b>	<b>BIOTIC AND ABIOTIC STRESS TOLERANCE</b>	<b>CROP PRODUCTION AND MANAGEMENT</b>	<b>MOLECULAR GENETICS</b>
	(Main Meeting Room)	(2 <sup>nd</sup> Floor Senate Meeting Room)	(2 <sup>nd</sup> Floor Left Meeting Room)	(2 <sup>nd</sup> Floor Right Meeting Room)
	30.05.2016 MONDAY	30.05.2016 MONDAY	30.05.2016 MONDAY	30.05.2016 MONDAY
13 <sup>30</sup> -15 <sup>30</sup>	<i>1<sup>st</sup> Session Chair: CARLOS FEOLI</i>	<i>1<sup>st</sup> Session Chair: DR MARIA JOITA- PACUREANU</i>	<i>1<sup>st</sup> Session Chair: DR VALENTINA ENCHEVA</i>	<i>1<sup>st</sup> Session Chair: DR RENATE HORN</i>
13 <sup>30</sup> -13 <sup>50</sup>	<b>Invited Speaker</b> <b>DR BRANISLAV DOZET</b>	The genetics and evolution of solar tracking – B. BLACKMAN, S. HARMER	Use of polymer hydrogel in soil moisture conservation for sunflower cultivation in rainfed situations of Northern Karnataka, India: A case study – U. SHANWAD, B. CHITTAPUR, SHANKERGOUD I, B. DESAI, GOVINDAPPA MR., V. KULKARNI	The cultivated sunflower pan genome provides insights on the wild sources of introgressions and their role in breeding – S. HUBNER, E. ZIGLER, J.R. MANDEL, D. SWANEVELDER, P. VINCOURT, N. LANGLADE, J. M. BURKE, L. H. RIESEBERG
13 <sup>50</sup> -14 <sup>10</sup>	Contemporary Challenges in Sunflower Breeding	Impact of exogenously applied glycine betaine on physiological attributes of sunflower under drought stress- NOSHIN I., NADIA Z., N. BATOOL, Q. BANO	Determination of the yield and yield components performance of some sunflowers ( <i>Helianthus annuus</i> L.) under rainfed conditions – I. DEMIR	Principal Component Analysis for Carbon Isotope Discrimination-Related Traits in Recombinant Inbred Lines of Sunflower – A. L. ADIREDDO, T. LAMAZE, P. GRIEU
14 <sup>10</sup> -14 <sup>30</sup>	Genetic analysis of seed yield related traits under optimum and limited irrigation in sunflower – M. GHAFARI	Rapid invitro screening of sunflower genotypes for moisture stress tolerance using PEG 6000 - SHANKERGOUD I., SHESHIAH K. C.	Appropriate nitrogen (N) and phosphorus (P) fertilizer regime for sunflower ( <i>Helianthus annuus</i> L.) in the humid tropics – E. AKPOJOTOR, V. OLOWE	Molecular Studies of Sunflower Responses to Abiotic Stresses – I. TINDAS, R. I. AYTEKIN, S. ÇALIŞKAN
14 <sup>30</sup> -14 <sup>50</sup>	Breeding for sunflower hybrids adapted to climate change: the SUNRISE collaborative and multi-disciplinary Project - LUBRANO-LAVADERA A.S., M. COQUE, MUNOS S., DEBAEKE P., MANGIN B., GOUZY J., KEPHALIACOS C., PIQUEMAL J., PINOCHET X.,	Exploring drought tolerance related traits in <i>Helianthus argophyllus</i> , <i>Helianthus annuus</i> and their hybrids – M. MUBASHAR HUSSAIN, M. KAUSAR, M. KHAN, P. MONNEVEUX	Interactive Effects of Different Intra-Row spacing and Nitrogen Levels on Yield and Yield Components of confectionery sunflower ( <i>Helianthus annuus</i> L.) genotype (Alaca) Under Ankara conditions – S. DAY, O. KOLSARICI	Comparative assessment of androgenic response in sunflower ( <i>Helianthus annuus</i> ) – N. AKGUL, E. ÇABUK ŞAHİN, Y. AYDIN, A. ALTINKUT UNCUOĞLU, G. EVCI, A GÜREL

19<sup>th</sup> International Sunflower Conference, Edirne, Turkey, 2016

	LANGLADE N.			
14 <sup>50</sup> -15 <sup>00</sup>	Discussion	Discussion	Discussion	Discussion
15 <sup>00</sup> -15 <sup>30</sup>	Coffee break	Coffee break	Coffee break	Coffee break
15 <sup>30</sup> -17 <sup>00</sup>	<b>2<sup>nd</sup> Session: Chair: DR VLADIMIR MIKLIC</b>	<b>2<sup>nd</sup> Session: Chair: DR FELICITY VEAR</b>	<b>2<sup>nd</sup> Session Chair: PROF DR GIAN PAOLO VANNOZZI</b>	<b>2<sup>nd</sup> Session Chair: DR PHILIPPE DEBAEKE</b>
15 <sup>30</sup> -15 <sup>50</sup>	Assessment of sunflower germplasm selected for cold tolerance under autumn planting conditions in Morocco - HOUMANAT K., MAZOUZ H., EL FECHTALI M., NABLOUSSI A.	<b>Invited Speaker</b> <b>PROF DR STEVAN MAŠIREVIĆ</b>	Global change adaptation: what future for sunflower crops and products? A foresight study for oilseed chains at 2030 horizon – E. PILORGE, A. M. TREMBLAY, F. MUEL	Molecular and genetic aspects of sunflower defensive response to downy mildew - T. ŞESTACOVA, A.PORT, M. DUCA
15 <sup>50</sup> -16 <sup>10</sup>	Perspective and challenges to develop high yielding, disease resistant and oil quality sunflower hybrids in India - R.K.SHEORAN		Sunflower diseases research progress and management	Bioactivity and Phytochemical Evaluation of Sunflower ( <i>Helianthus annuus</i> L.) Leaf Extract – Y. BIBI, A. QAYYUM, S. NISA
16 <sup>10</sup> -16 <sup>30</sup>	Stability performance of new introduced sunflower hybrids for seed yield and its components under Sudan conditions – A. A. M. ABDALLA	Control of Verticillium dahliae causing sunflower wilt using Brassica green manures - DESSERRE D., MESTRIES E., DECHAMP-GUILLAUME G., SEASSAU C.	Effects of Different Organomineral and Inorganic Compound Fertilizers on Seed Yield and Some Yield Components of Sunflower ( <i>H. annuus</i> L.) – S. SUZER, E. CULHACI	Molecular Studies involved in sunflower responses in drought stress - I. ALTINDAS, E. AKSOY, S. CALISKAN
16 <sup>30</sup> 16 <sup>45</sup>	Discussion	Discussion	Discussion	Discussion
16 <sup>45</sup> -18 <sup>00</sup>	<b>Poster Session</b>	<b>Poster Session</b>	<b>Poster Session</b>	<b>Poster Session</b>
19 <sup>30</sup> -	<b>Dinner Party (Courtesy of Syngenta)</b>	<b>Dinner Party (Courtesy of Syngenta)</b>	<b>Dinner Party (Courtesy of Syngenta)</b>	<b>Dinner Party (Courtesy of Syngenta)</b>

	31.05.2016 TUESDAY	31.05.2016 TUESDAY	31.05.2016 TUESDAY	31.05.2016 TUESDAY
09 <sup>30</sup> -10 <sup>10</sup>	<b>3<sup>RD</sup> Session Chair: DR OLIVIER COTTET</b>	<b>3<sup>RD</sup> Session Chair: PROF DR STEVAN MASIREVIC</b>	<b>3<sup>RD</sup> Session Chair: DR AMELIA BERTERO DE ROMANO</b>	<b>3<sup>RD</sup> Session Chair: DR DRAGANA MILADINOVIC</b>
09 <sup>30</sup> -09 <sup>50</sup>	Collection of wild <i>Helianthus anomalus</i> and <i>deserticola</i> sunflower from the desert southwest USA – G. SEILER, L. MAREK	Isolation and identification of pathogen of Sunflower <i>Fusarium</i> Wilt - JING G. YUAN YUAN Z., GUI Z., JIAN Z., KAI W., JUN Z.	<b>Invited Speaker</b>	Proteomic response of sunflower to drought stress – M. GHAFARI, M. TOORCHI, M. VALIZADEH
09 <sup>50</sup> -10 <sup>10</sup>	The b1 locus that controls apical shoot branching in <i>H. annuus</i> exhibits a molecular diversity linked to the breeding history of hybrids - DURIEZ P., BONIFACE, M. C., POUILLY N., VAUTRIN S., MAYJ., RODDE N., BERGES H., CARRERE S., GOUZY J., P. VINCOURT, J. PIQUEMAL, S. MUNOS	Distribution of <i>Plasmopara halstedii</i> pathotypes in Hungary – R. BÁN, A. KOVÁCS, G. BAGLYAS, M. PERCZEL, G. TUROCZI, K. KOROSI	<b>DR PHILIPPE DEBAEKE</b>	Identification of HaDELLA, HaGID1 as well as HaSLEEPY and HaSNEEZY genes involved in gibberellin signaling in sunflower - R. EWALD, N. GEHM, L. POPIOLKOWSKI, A. ANTELMANN, R. HORN
10 <sup>10</sup> -10 <sup>30</sup>	Phenotypic and genotypic characterization of 400 new sunflower pre-bred lines – G. BAUTE, W. ANYANGA, E. ALBRECHT, L. H. RIESEBERG	Exploitation of the knowledge on oomycete effectors to drive the discovery of durable disease resistance to downy mildew in sunflower – Y. PECRIX, L. BUENDIA, Q. GASCUEL, C. PENOUILH-SUZETTE, L. GODIARD	Chemical Broomrape ( <i>Orobanche cumana</i> ) control in Clearfield® sunflower with different Imazamox containing herbicide formulations – M. PFENNING, M. VALTIN, S. SASCHA, J. BESSAI	Characterization of sunflower inbred lines with high oleic acid content by DNA markers – B. B. BILGEN
10 <sup>30</sup> -10 <sup>50</sup>	Developing well adapted hybrids in Europe by using a G*E approach - GAUTIER F., HELOISE H., MILAGROS G., SAUVAIRE D.	Response to sunflower ( <i>Helianthus annuus</i> L.) plant at early growth stage to cadmium toxicity – Y. CIKILI, H. SAMET, N. C. ATIKMEN	Pulsar® Plus and Eurolightning® Plus - herbicides for enhanced weed control in Clearfield® Plus sunflower – J. BESSAI, SCHLÄFER S., PFENNING M., MORAN D., CARTIN J.	Evaluation of WRKY and MYB transcription factors in some downy mildew infected sunflower lines; microarray data analysis – E. FILIZ, I. I. ÖZYİĞİT, R. VATANSEVER

10 <sup>50</sup> -11 <sup>00</sup>	Discussion	Discussion	Discussion	Discussion
11 <sup>00</sup> -11 <sup>20</sup>	Coffee break	Coffee break	Coffee break	Coffee break
11 <sup>20</sup> -12 <sup>30</sup>	<b>4<sup>th</sup> Session Chair: DR SINISA JOCIC</b>	<b>4<sup>th</sup> Session Chair: DR MICHAEL FOLEY</b>	<b>4<sup>th</sup> Session Chair: DR SUJATHA MULPURI</b>	<b>4<sup>th</sup> Session Chair: PROF DR RISHI BEHL</b>
11 <sup>20</sup> -11 <sup>40</sup>	Correlation studies between SSR marker based genetic distance and heterosis in sunflower ( <i>Helianthus annuus</i> L.) – V. KULKARNI, SHANKERGOUD I., SUPRIYA S.M, SURESHA P.G.	PCR combined with GFP tagged <i>Verticillium dahliae</i> confirmed the seeds transmission of Sunflower <i>Verticillium</i> Wilt - YUAN YUAN Z., GUI Z., JIAN Z., JUN Z.	Relationships between Germination and Vigor Tests with Field Emergence of Sunflower in Iran – H. SADEGHI, S. SHEIDAEI	<b>Invited Speaker</b> <b>DR STEPHANE MUNOS</b> De novo sequencing of the <i>Helianthus annuus</i> and <i>Orobanche cumana</i> genomes
11 <sup>40</sup> -12 <sup>00</sup>	Optimization of Agrobacterium-mediated gene transfer systems in Turkish sunflower ( <i>Helianthus annuus</i> L.) varieties – I. I. ÖZYİĞİT, S. KARADENİZ, H. TOMBULOGLU, E. FILİZ	Stability of the level of partial resistance to white rot in sunflower – M. ANABELLA DINON, F. CASTAÑO, S. SAN MARTINO, J. LÚQUEZ, F. QUIROZ	Pest Monitoring and Handling System Based on 4G Mobile System – C. ATLIĞ	
12 <sup>00</sup> -12 <sup>20</sup>	Inclusion of dominance effect in genomic selection model to improve predictive ability for sunflower hybrid performance – F. BONNAFOUS, N. LANGLADE, B. MANGIN	Genetic divergence among sunflower inbred lines and their convergent improvement for yield, quality and disease resistance- R. RANI - R. K. SHEORAN – S. CHANDER – R. K. BEHL	New seed treatment solutions for <i>Plasmospora</i> Resistance Management in Sunflower – F. BRANDL	Comparison of cytoplasmic male sterility based on PET1 and PET2 cytoplasm in sunflower ( <i>Helianthus annuus</i> L.) - HORN R., REDDEMANN A., DRUMEVA M
12 <sup>20</sup> -12 <sup>30</sup>	Discussion	Discussion	Discussion	Discussion
13 <sup>30</sup> -13 <sup>30</sup>	<b>Lunch (Courtesy of Edirne Farmer Union)</b>	<b>Lunch (Courtesy of Edirne Farmer Union)</b>	<b>Lunch (Courtesy of Edirne Farmer Union)</b>	<b>Lunch (Courtesy of Edirne Farmer Union)</b>
13 <sup>30</sup> -15 <sup>30</sup>	<b>5<sup>th</sup> Session Chair: DR THIERRY ANDRE</b>	<b>5<sup>th</sup> Session Chair: DR ROBERT NEMETH</b>	<b>5<sup>th</sup> Session Chair: PROF DR BENJAMIN BLACKMAN</b>	<b>5<sup>th</sup> Session Chair: PROF DR DEJANA PANKOVIC</b>
13 <sup>30</sup> -13 <sup>50</sup>	<b>Invited Speaker</b> <b>DR MARIA JOITA-PACUREANU</b> Broomrape ( <i>Orobanche cumana</i> Wallr.) - Update on racial	Cadmium-potassium interrelationships in sunflower ( <i>Helianthus annuus</i> L.) – H. SAMET, Y. CIKILI, N. C. ATIKMEN	Performance of sunflower hybrids in black cotton soils of Northern Karnataka, India – U. SHANWAD, SHANKERGOUD I, S. N. SUDHAKARBABU, V. KULKARNI, GOVINDAPPA MR, VIJAYKUMAR G.	Approaches for improvement of resistance to powdery mildew in sunflower ( <i>Helianthus annuus</i> L.) – S. MULPURI, K. PALCHAMY, C. R. SANKARANENI, V. KODEBOYİNA



13 <sup>50</sup> -14 <sub>10</sub>	composition and distribution, host resistance and management	Effects of Micro Nutrients (Fe, Zn, B and Mn) on Yield and Yield Components of Two Sunflower ( <i>Helianthus annuus</i> L.) Cultivars in Urmia Condition – A. RAHIMI, J. JALILIAN	Modeling sunflower fungal complex to help design integrated pest management strategies - AUBERTOT J. N., MESTRIES E., M. A. VEDY-ZECCHINI, P. DEBAEKE	Genetic engineering studies on sunflower- M. E. ÇALIŞKAN, S. DAS DANGOL
14 <sup>10</sup> -14 <sub>30</sub>	Testing annual wild sunflower species for resistance to <i>Orobanche cumana</i> Wallr – S. TERZIĆ, B. DEDIĆ, J. ATLAGIĆ, S. JOCIĆ, D. MILADINOVIĆ, M. JOCKOVIĆ	Quantification of drought tolerance levels of sunflower inbred lines by means of <i>chlorophyll</i> -a fluorescence - A. S. BALKAN, NALCAIYI, S. CULHA ERDAL - O. GUNDUZ, V. PEKCAN, O. ARSLAN, N. CICEK, Y. KAYA, Y. EKMEKCI	Escape to tiny bug ( <i>Nysius simulans</i> Stål) attack across planting date adjustment in sunflower hybrid seed crops from southern BuenosAires province, Argentine – J. RENZI, O. REINOSO, M. BRUNA, M. AVALOS, M. CANTAMUTTO	<b>Invited Speaker</b> <b>DR NICOLAS LANGLADE</b> Genome-wide association of oil yield plasticity to drought, nitrogen and chilling stresses in sunflower
14 <sup>30</sup> -14 <sub>50</sub>	Determination of superior hybrid combinations in sunflower and testing of their resistance to broomrape ( <i>Orobanche cumana</i> Wallr.) In infested areas – O. GÜNDÜZ, A. T. GOKSOY	The effect of climate factors and climate change on the yield of sunflower ( <i>Helianthus annuus</i> L.) in Marmara region – H. GURKAN, H. BULUT, N. BAYRAKTAR, M. DEMIRCAN, O. ESKİOĞLU, N. KOÇAK	Current Situation, Problems and Solutions of Sunflower in the Central Anatolian Region – C. YAVUZ, S. CALISKAN	
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15 <sup>30</sup> -15 <sub>50</sub>	<b>Invited Speaker</b> <b>DR GORAN MALIDZA</b>	Effects of Naphthalene Acetic Acid and N6-Benzyladenine on Androgenesis in <i>Helianthus annuus</i> L. Anthers - S. DAYAN, H. ARDA	Microbial Dressing of Sunflower Seeds with <i>Trichoderma harzianum</i> KUEN 1585 – Y. S. YONSEL, M. SEVİM	QTL mapping for broomrape ( <i>Orobanche cumana</i> Wallr.) resistance in sunflower – I. CELİK, D. ZARARSIZ, A. FRARY, S. DOGANLAR
15 <sup>50</sup> -16 <sub>10</sub>	Integrated weed management in sunflower: Challenges and opportunities	Do cell wall proteins affect the setting of grains and their potential weight in sunflower? – D. CALDERINI, S. VASQUEZ, F. CASTILLO, P.	Green and brown bridges aid survival of multiple <i>Diaporthe</i> / <i>Phomopsis</i> species with a range of virulences on sunflower, soybeans,	Determination the genetic characterization of different lines of sunflower ( <i>Helianthus annuus</i> L.) by using genetic resources



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09 <sup>30</sup> -11 <sup>00</sup>	<b>7<sup>th</sup> Session Chair: DR MIGUEL CANTAMUTTO</b>	<b>REGISTRATION</b>		
09 <sup>30</sup> -09 <sup>50</sup>	The effects of applied herbicides on yield and oil quality components of two oleic and two linoleic sunflower ( <i>Helianthus annuus</i> L.) hybrids – F. ONEMLI, U. TETIK	<b>INTERNATIONAL SUNFLOWER OIL QUALITY SYMPOSIUM</b> Opening Ceremony		
09 <sup>50</sup> -10 <sup>10</sup>	New virulences of <i>Orobanche cumana</i> appear in Romania - PARVU N., TEODORESCU A.	<b>Session Chair: PROF DR MEHMET EMIN CALISKAN</b> <b>Invited Speaker</b> <b>Fabrice THURON</b> - "HO Oilseeds and Oils Market: Positioning Sunflower Today and Tomorrow		
10 <sup>10</sup> -10 <sup>30</sup>	Genetic characterization of the interaction between sunflower and <i>Orobanche cumana</i> - LOUARN J., M. C. BONIFACE, POUILLY N., VELASCO L., P. VINCOURT, B.	<b>Invited Speaker</b> <b>Prof Dr Nurhan TURGUT DUNFORD</b> Sunflower Oil: A Premium Oil for Food Applications		

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11 <sup>20</sup> -11 <sup>40</sup>	<b>Invited Speaker</b> <b>DR LAURA F. MAREK</b>	Oil content and oil quality characteristics of linoleic and high-oleic sunflower varieties cultivated in Turkey – B. ASKIN, M. AFACAN, V. BİCER, Ö. KARADAS, İ. KONUK	Quality characteristics of roasted sunflower seeds during storage - M. B. BAHAR, F. SEYHAN, B. OZTURK, B. TOPAL, F. S. BAYRAKTAR
11 <sup>40</sup> -12 <sup>00</sup>	Sunflower Genetic Resources	Determination of Textural, Rheological Properties and SFC, SMP Values of Oleogels Prepared Using Sunflower Oil – H. PEHLİVANOĞLU, O. S. TOKER, H. IMAMOĞLU, M DEMIRCI	Effect of different storage conditions on quality properties of raw and roasted sunflower kernels – F. SEYHAN, M. B. BAHAR, B. TOPAL, B. ÖZTÜRK, F. S. BAYRAKTAR
12 <sup>00</sup> -12 <sup>20</sup>	Four decades of sunflower genetic resources activities in India – M. DUDHE, S. MULPURI	Assessment of sunflower oil adulteration – A. CEVIK, A. UNVER	The Evaluation of Sunflower Harvest Waste as Silage Feed – S. BUYUKKILIC BEYZI, M. YILMAZ, Y. KONCA
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13 <sup>30</sup> -13 <sup>50</sup>	<b>Invited Speaker</b> <b>DR NADA HLADNI</b>	The effects of vacuum and atmospheric deep-fat frying process on total frying-use time of sunflower oil and on french fries quality – E. DEVSEREN, D. TOMRUK, U. BAYSAN, M. KOC, H. KARATAŞ, F. ERTEKIN	Study of the characteristics of cultivated varieties of sunflower, regarding the production of high quality sunflower meal with dehulling process - S. DAUGUET, F. LABALETTE, F. FINE, P. CARRE, A.MERRIEN, J. P. PALLEAU
13 <sup>50</sup> -14 <sup>10</sup>	Present status and future prospects of global confectionery sunflower production	Effect of curcumin nanoparticles on oxidative stability of sunflower oil-in-water emulsions – F. BOZKURT, M. T. YILMAZ, C. YILDIRIM	Acceptability of chapati Made With Supplementation of Sunflower ( <i>Helianthus annuus</i> L.) Seed Meal – M. KARWASRA, S. DHIYA

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14 <sup>10</sup> -14 <sup>30</sup>	Grain, kernel and hull characterization of oilseed and oilseed x confectionary genotypes- S. ZUIL, M. LAUREANO, P. ROCCA, M. DELLA MADDALENA	Application of artificial neural network on prediction of moisture content of the deep-fat frying of beef meatballs in sunflower oil-H.I. KOZAN, C. SARIÇOBAN, H. AKYÜREK	Some Antinutrients and in vitro Protein Digestibility of Home Processed Sunflower Seed Meal – M. KARWASRA, S. DHIYA
14 <sup>30</sup> -14 <sup>50</sup>	Effects of herbicide and salinity stresses on some defense responses of sunflower plant- A. KAYA	Effect of the Deep-Fat Frying Process on Aroma Compounds of Sunflower Seed Oil – S. KESEN, A. S. SÖNMEZDAĞ, A. AMANPOUR, H KELEBEK, S. SELLI	
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15 <sup>30</sup> -15 <sup>50</sup>	Quantitative Determination of Sunflower in Mixed Concentrate Feeds by Real Time PCR- M. KAYA,Z. KIYMA	The Effect of the ESSENTIAL OIL from <i>Citrus aurantium</i> as a source of natural antioxidant in sunflower oil – O. ERDOĞDU, A. BOZDOGAN	The Meeting of International Consortium for Sunflower Genomic Resources
15 <sup>50</sup> -16 <sup>10</sup>	The evaluation of annual wild <i>Helianthus</i> species for their morphological, phenological and seed chemical characteristics in field conditions – F. ONEMLI, G. ONEMLI	LC-DAD/ESI-MS/MS Characterization of Phenolic Compounds of Sunflower oil – H. KELEBEK, S. SELLI, A. S. SÖNMEZDAĞ, S. KESEN, G. GUCLU, O. KOLA	
16 <sup>10</sup> -16 <sup>30</sup>		Lessons from ten years of an interprofessional survey plan on sunflower food safety - S. DAUGUET, F. LACOSTE	
16 <sup>30</sup> -16 <sup>45</sup>	Discussion	Discussion	

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16 <sup>45</sup> -17 <sup>45</sup>	<b>ISA GENERAL ASSEMBLY</b>
17 <sup>45</sup> -18 <sup>00</sup>	<i>Closing Ceremony</i>
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09 <sup>30</sup> -12 <sup>00</sup>	Field Day in Trakya Agricultural Research Institute Visiting Demo Plots
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17 <sup>30</sup> -	Free Shopping Time

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**TESTING ANNUAL WILD SUNFLOWER SPECIES FOR RESISTANCE TO *OROBANCHE CUMANA* WALLR.**

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**ABSTRACT**

Broomrape (*Orobanche cumana* Wallr.) is a holoparasitic weed that attacks the roots of sunflower (*Helianthus annuus* L.) causing yield losses in excess of 30%. It affects mostly warm and dry regions. Development of resistant cultivars and optimization of agricultural practices are the most important tasks for broomrape control in affected countries. In Serbia, first severe infestations were recorded in the early 90s. IFVCNS breeding program for transfer of *O. cumana* resistance from wild *Helianthus* species first pointed to *H. petiolaris* ssp. *petiolaris* as an excellent donor of *Or* genes. Resistance of annual wild species to *O. cumana* has been evaluated in a long term characterization program. Starting from 1996, multiple tests were performed in the greenhouse and in the field with broomrape presence. Total of 7 annual *Helianthus* species and 182 accessions were screened for resistance. The highest percentage of accessions with no segregation for resistance was found in *H. petiolaris* (81%) followed by *H. niveus* and *H. argophyllus*. If resistance is expressed per plant, *H. petiolaris* and *H. niveus* had more than 90% of plants with no infection. *H. argophyllus*, *H. debilis*, *H. praecox* and *H. neglectus* were in the range of 77-86%, while *H. annuus* had only 37% of resistant plants and proved to be the most susceptible of the tested annual species. The obtained results pinpoint the most useful species and accessions for further work on keeping cultivated sunflower resistant to broomrape.

**Key Words :** wild annual *Helianthus*, resistance, *Orobanche cumana*