EWAC NEWSLETTER

2001

Proceedings of the 11th EWAC Conference

NOVOSIBIRSK 2000

Institute of Cytology and Genetics,
Siberian Branch of the Russian Academy of Sciences, Novosibirsk, Russia

and

Cereals Research Department, John Innes Centre, Norwich, UK

European Wheat Aneuploid Co-operative

NEWSLETTER

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Edited by
T.A.Pshenichnikova and A.J.Worland

Institute of Cytology and Genetics,
Siberian Branch of the Russian Academy of Sciences,
Novosibirsk, Russia

and

Cereals Research Department, John Innes Centre, Norwich, UK

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PREFACE

Worland T. (Secretary of EWAC)

Cereals Research Department, John Innes Centre, Colney, Norwich, NR4 7UH, UK.

In July, 2000 the 11th meeting of EWAC was held in Novosibirsk, Russia. The meeting was dedicated to the memory of Dr. Olga Ivanovna Maystrenko who died in 1999 after spending more than 30 years studying wheat cytogenitics in Novosibirsk. Besides hearing much about her work participants were also able to see a comprehensive collection of the stocks that she had developed growing in the field. Despite the expense and difficulties of reaching Novosibirsk in the middle of Siberia a record number of participants from 13 countries managed to attend the meeting. The meeting was extremely well organised and was a fitting tribute to the memory of Olga Maystrenko. During the meeting a very diverse range of oral presentations and posters was presented, many of which highlighted the wide involvement of Dr. Maystrenko in encouraging and directing cytogenetic research both at the Institute of Cytology and Genetics, Novosibirsk and also through collaborative research with Institutes throughout Russia and its former republics. It was pleasing to hear at the meeting that the 1997 proposal for a new co-operative project on "The detection and mapping of agronomically important genes in wheat" had commenced. The three established sets of intervarietal substitution lines that will form the basis of the project have been verified with molecular markers. Seed stocks have been multiplied and are available for all to use in detecting agronomically important genes in wheat. We know of interest in using the stocks to detect genes for resistance to pests and diseases and for bread-making quality. Hopefully, members will consider using these important stocks for studying other characters of interest. Since the formation of EWAC in 1967 in Cambridge, England, leadership has been informal led primarily by Prof. Colin Law and more recently by Tony Worland and colleagues at the John Innes Centre, Norwich, England. Now that Colin Law has retired and Tony Worland will be retiring around the time of the next EWAC meeting in 2004 it seems an appropriate time to elect an International Committee to secure the future of EWAC. To this end committee members were sought at the EWAC business meeting. Drs Andreas Boerner and Tatyana Pshenichnikova agreed to join Tony Worland on the Committee. We welcome any other members that were unable to attend the business meeting joining us. We hope to be able to welcome everyone to Norwich for the 12th EWAC meeting in 2004. We realise following all the hard work that was put into organising the very successful. Novosibirsk meeting will be a very difficult task.

OPENING ADDRESS

Shumny V.K., Director of the Institute of Cytology and Genetics, SB RAS, academician of the RAS.
Pshenichnikova T.A.: Secretary of the 11th EWAC conference, PhD.

Dear colleagues and guests,

We are glad to meet you in Russia at the 11th conference of European Wheat Aneuploid Co-operative (EWAC). It is taking place in Novosibirsk, Siberia's biggest city and an industrial centre of Russia situated on the banks of the great Siberian river Ob. It is also a big cultural and scientific centre where Siberian Branches of three Russian Academies of Sciences are located.

EWAC meetings have been held in almost all countries which are the members of this organisation for its more than 30-year history. Now a EWAC conference is taking place in Russia, in the country that participated in the 1st meeting of 1967 in Cambridge, England. O.I.Maystrenko who first began cytological investigations of common wheat both at the Institute of Cytology and Genetics and the USSR was then a delegate to represent the country. Since that time her work has been connected with developing the collections of common wheat aneuploid and substitution lines - the genetic inventory that enabled to considerably advance both fundamental investigations of cereals polyploid genomes and applied studies and produce the initial breeding material. Extensive collections of aneuploid and substitution lines were obtained by her. Genetic investigations of different wheat traits were conducted with the help of them.

Although Dr. Maystrenko has not been participating in EWAC meetings since 1981, she managed to maintain contacts with her foreign colleagues. She was just happy when the idea to arrange the next EWAC meeting in Novosibirsk was approved in Italy 3 years ago. It was a possibility for her to meet numerous colleagues and friends, acquaint them with multi-year investigations on wheat genetics at the Institute of Cytology and Genetics, Siberian Branch of the Russian Academy of Sciences and cytogenetic collections having been gained for 35 years. It is Dr. Maystrenko who deserved to be the main person at the conference more than anyone else. She was very worried about its success and wanted our best samples to be presented at it. Unfortunately she died a year before the opening of the 11th EWAC conference now dedicated to her memory. Her enthusiasm, capability and furtherance seem to have helped us cope with its whole organisation.

The subject-matters of the conference are very diverse. Reports on cereals cytogenetics and evolutions, genetic investigations on different plant functions and applied items are presented. All these matters have been dealt with to this or that extent by O.I.Maystrenko and are being worked out at the Institute of Cytology and Genetics.

Now it is a difficult task to arrange international scientific meetings in Russia because of its deep economic reforms. Therefore, we express our gratitude to the sponsors that supported the Organising Committee:

Institute of Cytology and Genetics, SB RAS,
Russian Foundation for Basic Sciences,
CYMMIT (International Centre for Wheat and Maize Improvement).

We thank all the participants of the 11th EWAC that arrived in Russia, the country where big political changes take place and, moreover, to far off and unknown Siberia to contribute to the scientific program. More than 60 participants from 13 countries of Europe, Asia and South America managed to arrive. We will do our utmost to make the work of the conference fruitful and effective, and we will try to make you feel comfortable in Novosibirsk to know more about Russia and Siberia, make new friends and useful scientific contacts.

Olga Ivanovna Maystrenko

1923-1999

O.I.Maystrenko was born 5 July, 1923 in Orsk city, in a rural Ukrainian family that moved to the South Urals at the beginning of the century. After finishing school in Samarkand (Uzbekistan), she entered the Timiryazev Agricultural Academy in Moscow in 1942. Olga studied at the Department of Breeding and Seed Farming of the Faculty of Plant Breeding. In 1947, after graduating from the Academy, she was assigned to Kirghizia to work at the breeding station where she bred spring and winter barley. Her personal qualities such as scrupulousness, preciseness, observance were marked in the records of that time and later became the base for her successful scientific career. In 1950 she began to attend her post-graduate courses at the All-Union Institute of Plant Breeding (A-UI PB) in Leningrad and in 1954 was certified as PhD for the studies of winter barley in Kirgizia. She began to work on wheat at that time, first in Kirghizia and then in Sverdlovsk city (Middle Urals) being Head of the Laboratory of Cereals at the local department of A-UI PB (1951-1960). Her work was connected there with cultivar tests of local and foreign wheat samples. It is here that her unsurpassed knowledge of wheat morphological and physiological properties and family trees developed. Wheat breeding was yield-focused, and little attention was paid to high protein contents and quality of flour due to the lack of grain in the country. One of the tasks of her laboratory was to conduct wheat technological tests of different origin to point out the most prospective ones for breeding. More than 450 current cultivars were studied, and it was detected that the cvs bred in Siberia and the Far East were, as a rule, characterised by low bread-baking qualities and protein content being adapted to the local environment. The cultivars of Canadian breeding such as *Prelude*, *Marquis*, *Reward* and others were of high quality and were thus incorporated into the breeding process. Diamant (Dm), a low-quality cv with high protein content, being grown in production fields of the Urals was utilized in crossing programmes to obtain high-protein cultivars. As a result, cultivars with a higher level of protein were obtained but they could not equal that of Dm. Olga believed this to be due to incompatibility of 2 agronomically significant traits. This was a favourable point of her constant scientific interest which she has been working at for 40 years. Olga came to the Institute of Cytology and Genetics in 1960 after the establishment of the Siberian Branch of the Russian Academy of Sciences, USSR, in Novosibirsk. This was not the best time to make a fully-fledged scientist when Soviet genetics was being persecuted. However, the work at a new scientific institution far away from the capital gave way to scientific thinking and freedom of creativity. According to her stories even though Olga had as a student studied genetics at Timiryazev Academy she had to reaquaint herself with many things and reconsider them at ICG. Special genetic seminars were conducted here for this purpose. She went on with her investigations on grain quality, first at the Laboratory of Radiational Breeding and Mutations. Those years were of special interest with respect to experimental mutagenesis. Therefore, Olga applied its methods for obtaining mutant varieties with improved agronomic properties. It was at ICG that she began scheduled investigations on the inheritance of high protein traits and flour quality. Intercultivar hybridisation in different combinations was used in her experiments for the purpose of establishing the inheritance of these traits, i.e. high quality cvs with high quality ones, low quality with low quality, etc. Dozens of cultivars were involved in hybridisation. Technological studies of hybrids were conducted beginning with the F1. A high volume of investigations was accompanied by methodological workouts on gluten studies. As a result, a more adequate micromethod, for those working conditions, of simultaneous determining gluten quality and quantity in a 2-grain flour suspension was created. The results of these investigations were published in the Soviet scientific journals and, probably, remained unknown to overseas scientists. Of course, an obscure genetic approach to the results was still absent in these works. A good example of Olga's approach would be the result of 5-year work published in 1966. Ninety-five combinations of 6 crossing variants were studied in which parents with high and low quality participated in F2-F6. The article demonstrates the scale of the investigations

conducted. In the results it was established that a successive decrease of gluten quality is observed till F6 in most of the crossings. The largest proportion of qualitatively valuable hybrids was revealed in crossings of high quality cultivars. However, some progeny had low-quality gluten. It was established that the parental crossing combination good X low quality is more preferable than average X average. The per cent of progenies with high quality was higher in the 1st combination than in the second. In her 1966 report Olga was able to conclude: «The character of hybrids segregation accounts for genes additive effects controlling the expressiveness of gluten quality. The segregation in hybrid populations from quality-contrasted cultivars enables us to reveal transgressions not only in the 1st but in the following progenies that points out the traits polygene control». Now much more is known about genetic control of gluten quality, particularly, about the control of grain proteins storage and their relation to quality. However, these historical data obtained by Olga agree well and can be explained with current knowledge about gluten structure. In 1965 she received the series of monosomic lines on cv. Chinese Spring from Prof. Ernie Sears. It is unlikely that Olga could predict how strongly the trend and scale of her work on wheat genetics would change, and that she and her colleagues would work in an entirely new scientific field without a possibility of consulting more experienced colleagues. The new research possibilities gave Olga deep optimism for future prospects. It always seemed that the more complicated and extensive a scientific problem was, the more enthusiastic and excited she was working to solve it. The work on producing simultaneously 2 series of monosomic lines on cultivars Saratovskaya 29 and Diamant began. It was the choice of these cvs that was connected with their technological properties - one is high-protein and the other is high quality. It is in 1966 that the work on studies of separate chromosomes genetic effect in the variability of wheat grains protein substances commenced. One could read in 1967 that «the results of single- and double-saturating crossings of a hybrid progeny with gluten quality-contrasted parental components suggest a comparatively low number of genes controlling this trait in the cultivars studied (2-4 pairs). It already becomes possible to obtain gluten quality of a backcrossed progeny considerably closer to its recurrent parent». The same was noticed later when producing intervarietal substitution lines on the cvs with contrasted technological properties. These conclusions agree well to now well documented key role of separate alleles of glutenin in determining bread-baking qualities. In 1968 the group was turned into a laboratory of wheat genetics, a big collective of 20 persons. The work was conducted first only in the south, Middle Asia, in Tashkent as the institute had no heated glass-houses of its own. When these were constructed in early 70's, the work on producing cytogenetic collections was conducted simultaneously in the south and in glass-houses in Novosibirsk. Olga was outstanding in sustaining such strained work requiring great attention and tension, and in her great organising skills of planning and thinking over future experiments for the years to come and in firm sticking to these plans. Her last records in which she laid down the plan of genetic experiments on *Triticum petropavlovskyi* and *T.sphaerococcum* have remained being sheduled till the year 2000. Olga's colleagues have continued the work although she is not with us now. The work of Olga Maystrenko was always well supported by Academician D.K.Beliayev, Director of the institute at the time when breeding in the USSR was still being influenced by Lysenko's ideas. He highly valued O.I. as an investigator and always recommended her works for presentations at different scientific meetings. Her work has been connected with producing new aneuploid series since 1969. A rapid accumulation of data on cytological studies of meiosis in saturating crossings was obtained; its peculiarities in different cvs and aneuploids were revealed for different chromosomes. A part of these data was later published at our institute in the monograph «Cytogenetic studies of aneuploids in common wheat» (1973). Thus, the sets of monosomic, ditelosomic and monoditelosomic lines in cvs Diamant (Dm) and Saratovskaya 29 (S29) were produced in the middle 70s. Further on, the work on producing different sets of intervarietal and wheat alien substitution lines began. All the material was involved in the investigations on

different agronomic traits such as yield, drought tolerance, frost resistance, shortage of mineral elements and technological properties. Later, the laboratory conducted experiments on the key physiological trait of wheat - sensitivity to vernalisation. Chromosomal localisation of genes *Vrn-A1* and *Vrn-D1* (formerly *Vrn1* and *Vrn3*) was established. Many cultivars were studied on this trait. Olga tried to find out the reasons for differences in terms of vernalisation in different winter cultivars. To study this trait more profoundly, a series of intervarietal substitution lines on cvs Dm and S29 with chromosomes 5A and 5D from winter cvs was produced. To avoid a laborious cytological analysis, morphological trait-markers controlled by genes *Vrn-A1*, *Q* (factor of speltoidness) and *B1* (awn inhibitor) were used. These 71 lines were later involved in genetic experiments in the studies on cold and frost resistance, drought tolerance, reaction to the shortage of mineral nutrition and flour quality. The end of 60s and 70s were the years of active contacts with foreign colleagues. Olga happened to participate in 3 meetings of the European Wheat Aneuploid Co-operative. E. Sears and G. Kimber visited ICG to get acquainted with cytogenetic works. Her scientific correspondence with R. Morris, C. Law, K. Konzak, L. Pagsly and other famous specialists in wheat genetics has remained in the archives. She had a report at the Genetic Congress in Moscow in 1978, contacts with colleagues from all over the USSR being numerous. Many used the scientific material obtained under her supervision and discussed the results of investigations with her. Olga's participation and membership in different scientific organisations of the USSR won universal acclaim. She was also a Presidium member of the Siberian Branch of the All-Union Geneticists and Breeders Society, member of the Council for problems in genetics and breeding under the USSR Academy of Sciences, elected as a member of organisation committees at many symposia and conferences. Olga raised many disciples that now work in the former Soviet republics of Kazakhstan, Kirgizia, Aizerbaijan and, of course, in Novosibirsk. The results of her investigations in 80s and 90s are published in the USSR and abroad. Publications showed that she managed to realise her dream, i.e. to get the samples combining high protein content and good flour quality in one genotype utilising intervarietal substitution lines Dm/Novosibirskaya 67. The investigations on chromosome localisation of 20 genes with regard to common wheat morphological and physiological traits were conducted under her supervision. Many genes were detected and registered in the Catalogue of Gene Symbols for Wheat. In recent years the difficulties being overcome by Russia affected the work of Olga and colleagues interrupting planned investigations on extremely interesting studies on genetics of mineral nutrition and wheat resistance to heavy metals that are very important in connection with ecological problems. It has now become difficult to preserve the extensive collections that certainly can be called a national possession. The scientific team that worked alongside with Olga has managed to preserve the trend of the chosen investigations, scientific inventory and ideology created for many years and decades. Now one can firmly state that there exists the School of Maystrenko. Olga herself used to be a successful and very strict pedagogician, developing exclusive accurateness and successiveness in the work of her disciples making them observant to achieve what they want. Not everyone could perceive this school, but if a person developed these qualities, he or she got her unanimous support. Many works done under her supervision were presented at the EWAC conference. The participants had a possibility to get acquianted with only a part of cytogenetic collections produced under O.I.'s supervising. There was a photo exhibition dedicated to her life and work. It was a fitting tribute to the dedicated life's work of Olga Maystrenko that EWAC conference was held in Novosibirsk. In July 2000 the opening session was dedicated to her work. Participants who knew Olga were able to provide many scientific results to prove her work, the information that overseas participants were interested in.

T.A. Pshenichnikova, Institute of Cytology and Genetics SB RAS, Novosibirsk

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