

more direct evidence of the existence of transpeptidation reactions involving α -peptides which are catalysed by plant enzymes.

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AGRICULTURAL GENETICS

CONFERENCE AT RIETI

A MEETING on agricultural genetics held at Rieti during May 30–June 3, although originally announced as a meeting of the Italian Society of Genetics and Eugenics, proved to be a truly international gathering, with representatives from Sweden, France, Switzerland, Spain, Portugal, Yugoslavia, Great Britain, the United States and Israel, and about two hundred Italian delegates. The opening ceremony was attended by the Under-Secretary for Industry and Commerce and many distinguished national, provincial and municipal officials. The meeting was organised by Prof. Carlo Jucci, of the University of Pavia, who was very largely responsible,

by his enthusiasm, energy and wide scientific competence, for its success. The opening address was given by Dr. P. S. Hudson (Commonwealth Bureau of Plant Breeding and Genetics, Cambridge), who represented the headquarters of the Food and Agriculture Organisation, and speaking in Italian on "Genetics and Agriculture in International Organization", described the Organisation's World Catalogue of Genetic Stocks. This is a first attempt on a world scale to organise the collection and maintenance of information and living material of agricultural crop plants of potential value to plant breeders.

The second contribution was a paper by Dr. Å. Gustafsson (Sweden), on "Induced Mutations and the Viability Problem". Here some interesting data were given concerning certain mutants obtained by X-ray irradiation of barley. Many of these were of good viability, and some were fully fertile, so that irradiation clearly has potentialities as a tool in plant-breeding. Carefully controlled comparisons over several seasons gave indications that some of these mutations yield best in the years when the mother variety (in this case Maya barley) does not do so well. Dr. Gustafsson pointed out that this is in contrast with colchicine-induced polyploids, the seasonal yields of which follow those of their mother strains. Some mutant lines gave their highest yields with medium dressings of nitrogen, and were depressed by higher dressings which increased the yields of the mother strains. These and other data seemed to provide excellent demonstrations of the generalization that particular alleles each have their specific physiological optima. Irradiation has given rise to one very early line in barley, and to a line which has straw stiffer than that of any other known variety, and which is now already cultivated to a limited extent in Sweden. A line of white mustard with 4 per cent higher yield and higher mustard content has been selected from irradiated material; but in view of the cross-pollination of this crop some uncertainty is felt as to whether this line has originated as a result of the irradiation. Interesting agronomic comparisons of chlorophyll-deficient mutants in barley were also given. Homozygotes of these are lethal, and in one case the heterozygotes, which gave lower yields than the normal in pure stand, gave higher yields under certain special conditions involving competition with normals in segregating progenies, and this superiority was greatest where competition was most intense. It was also shown that certain spontaneous chlorophyll-deficient lethals in barley, the single heterozygotes of which are in certain characters similar to the normals, are superior in dihybrid combinations, and the interesting view was expressed that such deleterious mutations may have taken a positive role in evolution.

A somewhat similar point of view was expressed by Dr. A. Câmara (Portugal), in an address on "Possible Contributions to Plant Improvement", in which an outline was given of the plant-breeding work in progress in Portugal and the methods employed. These include the artificial induction of mutations and polyploids, and the study of the cytological interrelationships of the species in wheat and other plants and the significance of polysomics.

The second day was devoted to discussion of the improvement of cereals, particularly wheat. Dr. Å. Åkerman (Sweden) outlined the history, organisation and achievements of the Swedish Seed Association at Svalöv. It is estimated that plant breeding and

improved agricultural methods together have led to an increase of almost 50 per cent in the yield of wheat in Sweden, and increases of slightly more modest order in other crops. Attention was early devoted to investigation of the potentialities of special techniques such as the artificial induction of mutations and polyploidy. The latter technique appears to be most successful in crops which are grown for their vegetative parts, since fertility is usually depressed. Useful polyploid strains of alsike, red clover and winter rye are already available, and barley, rye, wheat, timothy, mustard, turnip, mangolds and sugar beet show promise. The importance was stressed, in all methods of breeding, of undertaking selection work on a sufficiently intensive scale, and of adequate facilities for field tests over a wide range of conditions. In connexion with the urgent problem of breeding a more winter-hardy wheat, resistance to winter damage by *Fusarium*, *Typhula* and other pathogens is of importance; laboratory methods of testing cold-tolerance were described, and the importance of preliminary hardening was stressed. Old land races are strongly winter-hardy but deficient in all other respects. Yield of winter wheat has been increased 70 per cent during the past fifty to sixty years, and half this increment is due to breeding. Baking-quality was not at first adequate, but, as Sweden became self-supporting in wheat, interest was taken in this feature, and Sweden can now obtain fully satisfactory baking flour by the blending of domestic winter and spring wheats. The contribution of the plant breeders to yield-increase in the spring wheats is estimated at a little more than 20 per cent.

In oats, of which only spring varieties are grown in Sweden, the important observation has been made that yield is not necessarily closely correlated with maturity class. Yield increments of 10–20 per cent are attributed to the breeder.

A short reference was made to oil plants. Cultivation of these was resumed in 1940 as a contribution to the supply of fats in the national diet. They now occupy an important place in the economy of the country, and their cultivation is being maintained, 170,000 hectares having been grown last year. The important oil crops are rape, white mustard and linseed. In addition to straightforward selection for winter hardiness, work is proceeding with polyploids and with interspecific crosses, the latter especially in the genus *Brassica*. Tetraploid types of all species groups of this genus have been obtained; but their vigour is in no case greater than that of their parent types, and often lower. The high-chromosome number species have been artificially synthesized, and these now offer a possibility of introducing winter-hardiness into rape. Progress has been made in improving the fertility of synthetic species through selection. Finally, Dr. Åkerman gave a brief description of provisions for testing, multiplying and distributing improved seed.

Dr. O. Gasparini discussed problems in connexion with seed production in Italy, and Dr. V. Boceta described some interesting results obtained in Spain with maize hybrids produced by crossing plants selected from consanguineous lines, a method which produces notable improvements in less time than that required for the selection of inbreds.

Dr. A. Dionigi described the work of the Nazareno Strampelli Cereal Research Station at Rieti, and the new direction it has taken since the death of the famous breeder, N. Strampelli, former director of the Station. The method now employed consists of

making large numbers of crosses (two thousand or so have been made this year) and subjecting the hybrid material to preliminary testing under artificial conditions of environment—for example, in cold chambers at 4° C. for varying periods—before testing them in the field. It was explained that varieties even with the same maturity-period differ in the length of their various developmental phases, and that the treatment permits analysis of these phases and hence facilitates the selection of lines adapted to particular environmental conditions (elevation, cold, humidity, rust prevalence, etc.). It is claimed that, by subjecting segregating progenies to cold-chamber treatment, types can be selected which have developmental phases which are known, from experience and from comparison with standard varieties, to be suitable for particular conditions.

Dr. G. W. Adriance (United States) spoke on "Fruit Breeding Problems in Texas", mentioning especially the production of peaches with a low degree of cold-requirement and capable of giving fruit in Texas, where the winters are often so mild that the common peach varieties cannot be grown. Mild-winter tolerance was derived from the Chinese honey peach, which is not of the best quality and was therefore crossed with commercial types. Mention was also made of work with raspberries, figs and grapefruit. In connexion with the latter, he directed attention to the use of nucellar seedlings to screen out virus diseases, and as a means of rejuvenation of the variety.

Dr. Chanan Oppenheimer (Israel) spoke on fruit-breeding problems in Israel. He referred to the difficulty of growing apples, which suffer damage to blossom through lack of shade during the very hot days of early spring at a time when the trees are still leafless. Pollen-sterility and differences in time of flowering make hybridization with a small-fruited, locally adapted type difficult, but crosses with European types have been obtained, and these in later generations show transgressive segregation for time of leafing. Dr. Gustafsson recommended X-radiation of European types in an attempt to induce bud-mutations which might well be expected to include precocious leafing types.

Dr. A. Morettini presented a useful outline of the fruit-breeding work that has been done in Italy. Special mention was made of the achievements of Pirovano, who as the result of a half-century's labour has produced many excellent varieties of table grapes, some of them possessing special characters, such as a rose flavour or seedlessness, and others possessing new combinations of desirable characters such as high yield, earliness and large fruits. Valuable varieties of pears and peaches produced by Pirovano were also mentioned. Dr. Morettini then described his own work at Florence in producing improved varieties of peach, plum, pear and apple. Attention has now been turned also to the Japanese persimmon. Among the activities of other workers, special mention was made of the discovery at Acireale in Sicily of lemon varieties resistant to the die-back disease (*mal secco*). He stated that the genetic aspects of fruit-breeding have received little attention in Italy and that much requires to be done, especially on such characters as keeping-quality and transportability in relation to export requirements. He made a special plea for further support of such work, including the establishment of a fruit genetics research institute.

Dr. M. Marinucci discussed the problems of olive-breeding in Italy, pointing out the need for a funda-

mental attack from the genetic angle even though this should take centuries to complete. The existing varieties, of which there are many, all have some defect or other, and improvement in such features as drought- and cold-resistance would lead to great increases in production. Examination of further material from the centre of origin was strongly recommended. Studies on floral biology are important in the search for self-compatible varieties. Particular mention was made of work being carried out under Dr. Marinucci's direction at Perugia, where studies of respiration and glycolysis in different combinations of stock and scion have shown which combinations are the most favourable. Differences have been observed even between reciprocal combinations, expressing the different capacities of the respective varieties to utilize raw materials. In the discussion, Dr. R. Ciferri gave his views on the evolution of the cultivated olive, which seems to have been by a process of introgressive evolution, the hybrid evolved by a process of continued backcrossing with one parent, while the other parent of the original cross has disappeared. To what extent modern concepts of species variability had been taken into account in formulating this hypothesis was not clear.

Dr. G. Dalmasso outlined the history of vine-breeding from the pre-phylloxera period to the present day. Interesting points that emerged were that whereas French and German breeders had been almost completely preoccupied with attempts to achieve the hitherto unattainable goal of the direct-producer hybrid, in Italy the two Pirovanos, father and son, had gone ahead with improving the quality of the available material within the European grape species, and so attained the excellent series of varieties now available for grafting on to resistant stocks. Similar activities were carried on at the Viticulture Station at Conegliano under the direction of Dr. Dalmasso himself. He now considers, however, that it may well be profitable at this stage to re-examine the German method of approach, experience having shown that certain resistance genes do exist in the European vines, and by using large numbers of hybrids in advanced generations it is possible that the ideal direct-producer may yet be achieved. He further pointed out that, with the present knowledge of the laws of plant distribution, it is still possible that further collecting expeditions in America might reveal the existence of species capable of giving resistant hybrids of high quality.

The fourth day was devoted to grassland problems. The first contribution was by Dr. F. Marschall (Switzerland) on "Plant-Sociological Considerations regarding Alpine Pastures", in which it was shown that alpine plant species exist in many different and quite definite races, and that the classification of the associations is much more complex than has been supposed. A thorough study of these associations from the plant sociological point of view will undoubtedly help in selecting genetically suitable forms.

Dr. T. J. Jenkin, speaking on "Genetic Problems in the Breeding of Forage Grasses", described the work of the Welsh Plant Breeding Station in evolving strains of pasture grasses of greatly improved persistency and quality. By blending appropriate basic strains carefully selected for known characteristics, mixtures suitable for almost all sets of growing conditions in the British Isles can be obtained. Attention is being devoted to the production of special types for silage and grass-drying.

Interesting views were expressed concerning the evolution of the British strains of *Lolium perenne* from the annual *L. rigidum* of the Mediterranean. Though it has changed in very many genes and gene complexes, it is still not so completely adapted as to survive out of cultivation. On the other hand, *Festuca*, which has evolved by polyploidy, has produced species capable of surviving under ecological conditions other than those to which the parental species are adapted. This should be borne in mind in judging artificial polyploids, which may be inferior in the parental area but yet prove superior in an area outside the range of the parents.

Dr. G. Haussman (Lodi), in a paper on "Problems of Forage Plant Selection in Relation to the Fertility Potentialities of the Soil", laid special stress on the capacity of different plants to influence the soil structure, owing largely to differences in the type of root system they produce. Selection for the types most effective in this respect will contribute materially towards improving the quality of the swards and raising the production capacity of the land.

Dr. M. Mendizábal (Spain) described the work of the agricultural experiment station for arid zones at Almeria, the main problems of which are to find plants capable of growing under conditions where the mean annual rainfall is only 200 mm.

Dr. F. d'Amato (Pisa) gave an account of experiments in which 'Gammexane' was shown to have certain advantages over colchicine as a polyploidizing agent, especially in its low toxicity; it is effective over a very wide range of material. Dr. T. Castelli (Perugia), after giving a review of Winge's work on the genetics of the yeast fungi, reported some observations of his own in which a close correlation between spore form and fermentation capacities was demonstrated.

The final session on the fifth day was held at the Pontifical Academy of Sciences in the Vatican City. Dr. R. Esteruelas (Spain) reported on the work of the Aula Dei Agricultural Experiment Station near Zaragoza, where the activities, all directed towards improving the local crops, are divided into plant-breeding, cytology, ecology, phytopathology and physiology.

Dr. R. Tóñez (Spain) referred to difficulties in applying the present systems of classification of wheat species and varieties to a large collection of agricultural varieties, and proposed that a meeting of interested parties should be organised at the next International Genetics Congress in Rome. The meeting unanimously agreed with this proposal.

One of the evening sessions was devoted to a visit to the projected Apennine Research Centre, to be operated jointly by the University of Pavia and the National Research Council. This Centre is a development of the work of Prof. Carlo Jucci in this locality during the past fifteen summers. It is situated in isolated country and with a magnificent outlook at an elevation of 1,730 metres on Monte Terminillo, a few miles from Rieti. The laboratories, in a converted barracks, are nearing completion, and are intended for general biological studies in the fields of taxonomy, cytology, histology, phytopathology and physiology. Particular emphasis will be given to studies in botanical evolution and adaptation on much the same lines as those followed by Jens Clausen and his co-workers at Palo Alto in California. Prof. Jucci hopes also that this will become an international study centre.