SOME SUMMARIZING IMPRESSIONS FROM THE FIFTH INTERNATIONAL RAPESEED CONFERENCE, MALMÖ, JUNE 12-16, 1978.

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The Fifth International Rapeseed Conference marks a milestone in rapeseed growing in so far as we now have available double zero varieties and soon will have these for the whole rapeseed growing area of the world. This means varieties with a very low content of both erucic acid and glucosinolates. The value of such material can hardly be overemphasized. We may assume, that at conferences in the future the characteristics and the value of such varieties and how they can be further improved will be discussed.

The impressions, which we shall give an account of here, have to a great extent been compiled by the Swedish co-workers, who have assisted at the different sessions. We would therefore like to extend to them at this occasion our sincere thanks both for their good cooperation and for the summaries, which they have presented us.

BREEDING FOR YIELD

Since the problem of producing double zero varieties has now been solved, the research work with rapeseed has been concentrated on other problems of interest for the breeding work. One of these is the improvement of yield of the rapeseed crop.

The following summary was given from the session, dealing with papers in which the possibilities of increasing the yield were discussed. Some papers discussed the influence of different yield components of the final production. These also presented interesting surveys of results obtained.

Papers dealing with research work on anther culture and the production of hybrid seed of rape presented some very interesting data. In one of the lectures it was stated, that the anther culture technique can be a valuable help for the breeding of turnip rape by the possibility offered to produce homozygote lines in one step and the effective selection of desired recombinations from F_1-populations.

The possibility of utilizing self-incompatibility in order to produce F_1-hybrids was emphasized. The yield from the first F_1-hybrids produced has been promising. It was calculated that the production of F_1-hybrids would be economically profitable if these hybrids would out-yield older varieties with 20 %.

Studies are underway to use restorer genes from Raphanus in the work with cytoplasmatic male sterile rapeseed. The production of F_1-varieties should, for many reasons, be easier in rapeseed than in cereals and we will, probably, within 10 years have hybrid varieties for practical use.

A few words may be allowed about a problem that has not been discussed during the conference, but which is still of great importance. It is well known, that the oil crops (except the soyabean) require high amounts of nitrogen to produce acceptable yields. The price of nitrogen has gone up considerably during the last years. This year Dr. Roland Jönsson at Svalöv has started a study to find out, if there are differences among

rapeseed varieties with regard to the utilization of nitrogen. No results can, of course, yet be given, but the project itself seems to be worth while mentioning.

In one of the papers it was pointed out, that the need for quality improvement and the intensiveness with which this breeding work has been performed has prevented the breeder from also considering the need of disease resistant varieties, which can have a negative effect also for other Brassica-species.

Intensive work is in progress to find herbicides, which can be used in rapeseed and turnip rape. One could also look at the problem from another point of view and select rapeseed lines, showing a better tolerance against herbicides. This is an interesting idea, which was discussed in one of the papers, and it should, if realized, increase the possibilities for weed control in rapeseed.

BREEDING FOR QUALITY

Even though the breeding work aiming at yield improvement in rapeseed has come more in focus there is still a marked interest for further quality improvements. Work is going on, both in Canada and in the Federal Republic of Germany, to improve oil and protein content in rapeseed. It is well known that protein content and oil content are negatively correlated. In spite of this it is possible to increase the sum of the two substances in the seed. Some studies have elucidated the mode of inheritance of oil content and the content of oleic and linoleic acid. The mode of inheritance of erucic acid is also clearly demonstrated.

The mode of inheritance of glucosinolates was discussed in some papers from India, in which also the possibilities to improve oil and/or protein content by breeding and to reduce the content of erucic acid and glucosinolates were discussed.

The results from a number of methodological studies were presented. Of special interest were those from Göttingen dealing with glucosinolate analyses. It is now possible to perform analyses on very small amounts of material and it has also been possible to overcome some of the analytical problems.

Some simplifications of the fatty acid analysis were demonstrated in a paper from Sweden.

AGRONOMY, GENERAL

The following comments were given in the report from many papers in the session dealing with agronomy, general. The conditions for rapeseed growing differ from country to country. Therefore, it is difficult to present more general conclusions. But here are, of course, some common problems, which were discussed during this session.

The choice of variety is of great importance, which was also pointed out, and one must have in mind, that there are interactions between variety, sowing time, seed rate and row space. Too little attention has until now been paid to the fact, that there are species as well as varietal differences concerning root development.

Consideration of the crop rotation is a prerequisite for a successful rapeseed growing. This is not the least true, with regard to the erucic

acid content during the change-over from the growing of high erucic acid varieties to those with a low content.

Some papers reported on the value of a rapeseed crop in rotations where cereals are dominating.

Attention should also be given to the development and the stand of the rapeseed crop. The stand can have an influence on the use of herbicides and should therefore be considered when discussing environmental problems.

Finally the harvest methods and the harvest time are of extraordinary importance for the yield and quality of the rapeseed crop.

AGRONOMY, PESTS

The rapeseed crop deserves great attention and interest in connection with plant protection.

Unfortunately, the crop is still in need of a large number of pesticides for its protection. But we must always have in mind the value of rapeseed for its beneficial influences in crop rotation, particularly in dominant cereal cropping systems.

The papers presented clearly demonstrate that there are possibilities to reduce the need for pesticides as well as the problems around them, by entering the troublesome and resource demanding road of pest management.

But surely there are other trends too. The possible use of the broad acting substances ought to be investigated more closely.

Concerning weed control there is also a trend of using more herbicides replacing other methods.

But yet, the papers presented have given us valuable pieces of knowledge to add to our total knowledge of the rapeseed crop. For the future there is a strong need for ecological knowledge together with resources for the construction of an effective system of warning and prognosis giving the growers the service they do need to be able to accomplish a complicated system of plant protection.

SEED AND OIL CHEMISTRY

Important new information was presented on the chemistry of rapeseed and its products. Of particular value to the rapeseed breeder were four reports concerning the chemical changes in the plant during its growth, such as the timing and sequence of the synthesis of the fatty acids that become the oil ultimately extracted from the seed and something about the synthesis of linoleic acid, the fatty acid regarded as specially valuable in human nutrition. Another researcher reported on nitrate reductase as a possible factor in generating protein for accumulation in the seed and the generation of glucosinolates in the growing plant was also reviewed.

There were reports from four laboratories dealing with improved assay methods, including the use of minicomputers, for expediting and improving the accuracy of quality assessment of rapeseed and its products, for both research and commercial application. One report emphasized the need for including thiocyanate precursors in describing the glucosinolates in rapeseed.

Konwledge about the composition of rapeseed oil was extended through reports on the minor fatty acids normally present. New information was given on the nature of the polysaccaride carbohydrates and lignin in rapeseed. Two reports dealt with the nature of proteins, peptides and amino acids in concentrates and isolates and the changes that occur during processing.

PROCESSING OF RAPESEED AND ITS PRODUCTS

There were eight presentations dealing with processing technology. Two reports from Canada contained observations on experience acquired in the extraction of the new low glucosinolate, low erucic acid cultivars, Tower and Candle, rapeseed. Others reviewed the state of the art of rapeseed crushing or extraction and one report incluced simulation modelling. One report was concerned with the kinds and amounts of sulphur and nitrogen compounds found in rapeseed oil before and after refining. It was observed that of 10 compounds found all of them were reduced to below the detection limits of ~1 ppm by the deordorization step.

Two reports pertained to the development of rapeseed protein concentrates. One dealt with aqueous extraction procedures that minimize solvent requirements and that minimize solids losses. The other was an examination of several Brassica species and hybrids as potential sources of food protein concentrates.

FUNCTIONAL PROPERTIES OF RAPESEED OIL AND MEAL PRODUCTS

Aspects of functional properties of rapeseed oil and meal products were covered by Dr. R. Ohlson's and five other papers. Selective and non-selective hydrogen of low erucic acid rapeseed oil (RSO) to obtain a series of iodine values allowed a study of trans isomers and of crystal formation, a matter of special interest in margarine manufacturing. Another scientist used X-ray differation techniques to study the same problem.

One of the reports pertained to production of a booklet designed to educate the consumer of rapeseed oil as well as food technologists, dietitions and home economists.

An investigation of rapeseed lecithins showed these to vary in nature according to seed variety and various factors in the processing of rapeseed. It was suggested that rapeseed lecithins would behave differently than traditional soybean lecithins. Rapeseed protein concentrate was claimed to be capable of texturing in the same way as soy protein and to have potential as a meat extender. Concentrates and isolates of rape are bland and they have very high water binding capacities. Results of flavour and texture tests of rapeseed concentrate and mixturing were presented.

NUTRITIONAL EVALUATION OF OIL AND PROTEIN FOR FOOD USE

In regard to the presentations on food uses of oil and protein from rapeseed it seems appropriate to deal separately with these two components. Against the background of concern evident at the two previous International Rapeseed Congresses, at Ste. Adele and at Giessen, about the question of erucic acid in the human diet, the nature of the reports at this conference is of great interest. Most of the studies reported here this year pertained to low erucic acid oils and the conclusions of at least 9 of the 14 reports presented indicate that the conversion to

low erucic acid cultivars has resolved the matter. The remainder of the reports did not specifically address the question of low erucic acid oils, used high erucic acid oil, were about methodology,were working on some basic tissue metabolism studies or else represented the view that further fundamental research was warranted. Several researchers presented findings on rabbits, pigs, monkeys and humans, thereby extending our knowledge from the rat, the most widely used animal model for human nutrition studies. The rat and in particular the fast growing male Sprague-Dawley rat, apparently displays some metabolic pecularities relative to other rat strains and other species of animals. These as yet unexplained differences suggest that findings derived from this rat cannot readily be generalized to apply to human fat metabolism. In this light the favorable findings with other species are encouraging findings on the food use of the low erucic acid oils.

There were six reports in this section on rapeseed protein concentrate (RPC). There was unanimous confirmation among researchers as to the superior quality of the protein in the concentrate with respect to the profile and availability of the amino acids. Problems reported previously following the use of rape protein concentrate in the diets of pregnant rats appear to be resolvable by a dietary supplement of zinc and the amount required has been determined. With the increasing availability of low glucosinolate cultivars for production of rape concentrate the potential for food use of RPC has improved substantially.

EVALUATION OF RAPESEED MEAL AND PROTEIN FOR FEED USE

Great interest was evident in the 28 reports given on rapeseed meal (RSM) for feed about 20% of the conference papers.It was obvious that the development of the low glucosinolate cultivars of rape by Canadian and European breeders has had a large bearing on the increased experimental work done since the Giessen meeting in 1974.

The reports showed that 10 % HGRSM was satisfactory in the concentrate mixture for dairy cows in long term experiments and 25 % of LGRSM was used successfully in shorter tests. While the use of RSM resulted in a slight reduction in iodine content of the milk that was corrected by supplemental feeding of iodine to the cows. It was also reported that roller milled whole rapeseed was a useful dairy feed ingredient especially when high levels of straw were used in the ration. Some attemps to utilize the by products from the manufacture of rape protein concentrate were less successful and warrant further study.

LGRSM has proven satisfactory as a total replacement for soybean meal in the diet of the breeding gilt and sow. No reduction in reproductive performance was observed over two reproductive cycles, even though there were minor changes detected in thyroid activity when the gilts first went on test as weanlings. Evidence was given that LGRSM was more digestible than HGRSM and that dehulling effected further improvement in degestibility.

The use of up to 10 % LGRSM in poultry layer diets resulted in performance and livability equal to soy diets. Up to 20 % LGRSM was used without impairing performance of broiler chicks. With both layers and broilers some thyroid enlargement was observed at three use-levels of LGRSM but weight gains, efficiency of feed conversion and economic returns were not adversely affected. Several other reports showed good results with broilers fed 25 % LGRSM.

Studies on the effect of RSM in layer diets on the incidence of "fishy eggs" confirmed the role of sinapine in RSM as well as the effects of layer strain involved and of intestinal microflora. One report involved the effect of HGRSM on the eating quality of broiler meat.

It was clear from the presentations that, while some aspects of LGRSM require continuing research, the advent of LGRSM has greatly exchanged its potential role in all classes of livestock and poultry.

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This our summary of the sessions, which have thus been discussed, perhaps has been very rhapsodic. Very much more should have been said in order to give full justice to the many valuable papers at this conference, but for detail one must refer to the distributed abstracts and the proceedings.

We began by pointing out the milestone, that this conference represented with access now to new rapeseed varieties with completely changed and considerably improved characteristics. We will finish by emphasizing, that this milestone is a result of a close and fruitful cooperation between scientists of different kinds, experts on nutrition and feeding, representatives of the food indusdry and trade and, of great importance, very stimulating international cooperation.

We hope that this cooperation will also be a trade mark for the continuation and the development of rapeseed growing all over the world, a trade mark for Le Group Consultatif International De Recherches Sur Le Colza.