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NEW DEVELOPMENTS IN RAPESEED BREEDING IN SWEDEN

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The most important oilseed crop in Sweden is rape, Brassica napus, of which the winter type holds about 60,000 hectares and the summer type 15,000 hectares. Of turnip rape, Brassica campestris, the winter type is growing on 20,000 hectares and the summer type on 5,000 hectares. The only other oilseed crop apart from rapeseed is white mustard, grown on 2,000 hectares. Breeding of these oilseed crops was undertaken first during World War I, then interrupted and taken up again during World War II. After the last war the growing as well as the breeding became more and more intensive. The record production of rapeseed occurred in 1968 (260,000 metric tons). The average yields of the oilseed crops mentioned have almost doubled during the last 25 years (Figure I). This considerable increase in yield is due to an interaction between improved cultivation techniques and improved varieties. The breeding material at Svalof today occupies some 20,000 plots. The breeding work tends to be more and more complicated as new items are included in the breeding programme. In spite of this fact we believe that new improvements will be achieved at the same speed as before.

The total consumption of vegetable oils in Sweden is about the same as the production of oil in rapeseed. Though Swedish margarine manufacturers use a fairly high percentage of rapeseed oil in margarine, it is not possible to utilize more than about 50 percent of the seed produced within Sweden and the rest is exported. The Swedish food industry is very interested in using the raw material produced within the country, if only the quality could be changed to meet with the demands.

As plant breeding seems to be the only economic way of changing the quality, selection for improved fatty acid composition has been carried out since 1962, and up to now the following variations have been found (Table I).

For the last three years there has been some production of winter rapeseed with a low content of erucic acid. This seed has been used by the manufacturers of margarine for experimental purposes. From next year on there will be a successive increase in the growing of varieties with a low content of erucic acid. The prices paid to farmers for this seed will be 10-15 percent higher than for normal rapeseed. The yield of the varieties with low C_{22} content grown up to now is 15-20 percent lower than in the best commercial varieties of normal

rapeseed. The progress in the improvement of varieties with low content of erucic acid has been considerable, and we think it will be possible to produce new varieties with a low content of erucic acid having about the same yield capacity as normal rapeseed within the near future.

TABLE I

VARIATION IN THE BREEDING MATERIAL OF RAPESEED AT SVALOF, SWEDEN

Fatty Acids		Variation Percent of Total	"Normal" Rapeseed
Palmitic	C 16:0	2 - 10	3
Oleic	C 18:1	7 - 70	10
Linoleic	C 18:2	10 - 40	13
Linolenic	C 18:3	4 - 25	9
Eicosenoic	C 20:1	0 - 20	7
Erucic	C 22:1	0 - 60	51

The total volume of rapeseed processed during the past few years has been so high that the market of rapeseed meal cannot absorb more, unless the content of glucosinolates is decreased. Through plant breeding, however, it has been possible to decrease the glucosinolate content to about 2 percent of that normally found in winter rapeseed. Strong efforts are being made now to introduce on the market new varieties with a very low content of glucosinolates as soon as possible. If a low content of glucosinolates should be combined with a low content of erucic acid, the breeding problem will be more complicated, and it will take 5-10 years to market varieties with the desired properties. Even if these varieties will lead to a higher consumption of rapeseed meal in Sweden, the value of this meal in comparison with, for instance, soybean meal will probably be lower as long as the rapeseed meal has its present high hull content (cellulose). By anatomic studies of the seed it has been possible to find considerable differences in the percentage of hull in different types of rapeseed. Especially in seeds having a yellow colour the percentage of hull seems to be much lower than in seeds with dark-coloured hull (Table II).

AVERAGE YIELDS OF OILSEEDS IN SWEDEN 1941-1968

FIGURE I

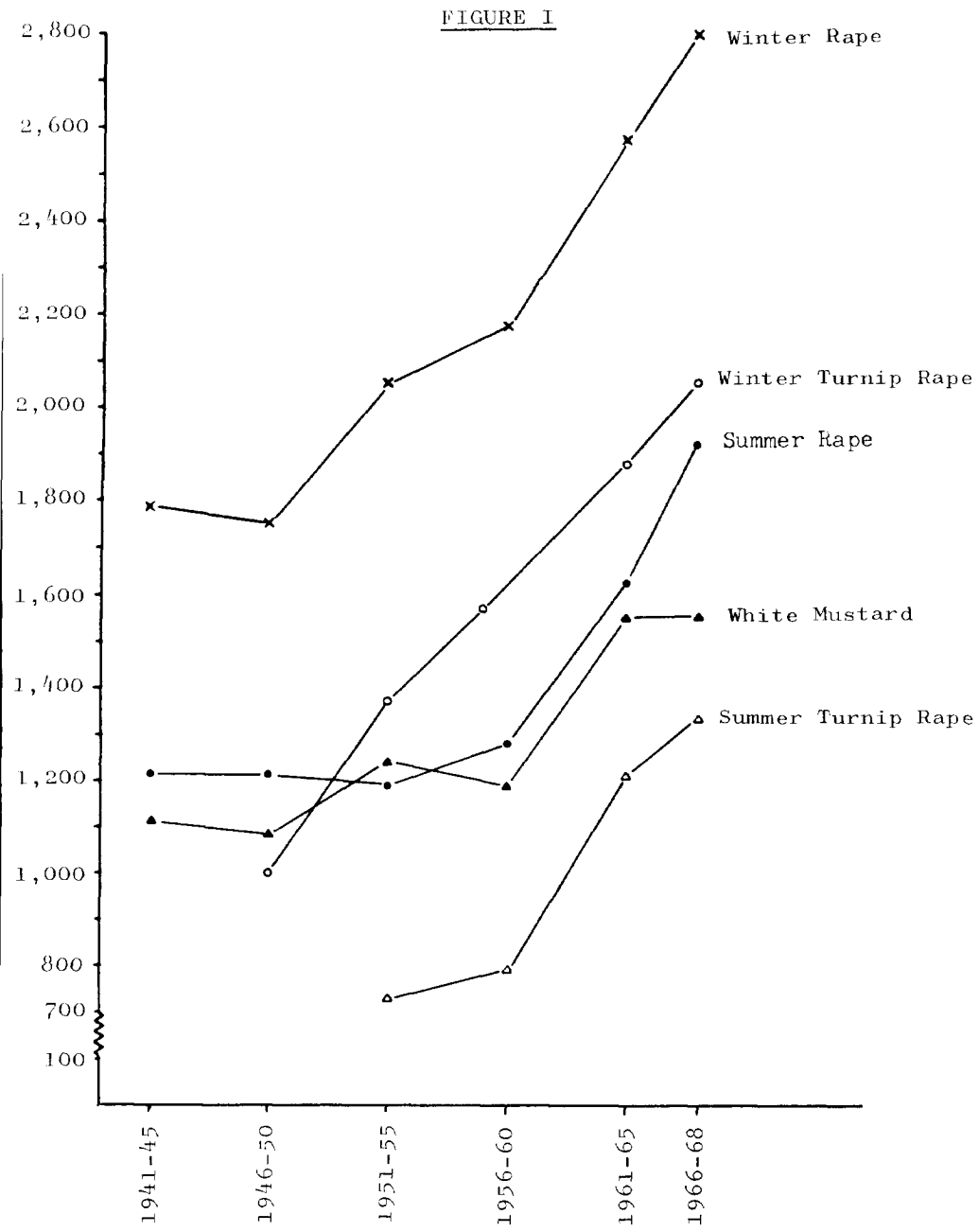

TABLE II

HULL AND CRUDE FIBRE IN OILSEED CROPS WITH BROWN AND YELLOW SEEDS

	Hull, Percent of Whole Seeds		Crude Fibre, Percent of Meal		F-Values. Comparison of Yellow and Brown Seeds
	Brown Seeds	Yellow Seeds	Brown Seeds	Yellow Seeds	
VITSENAP					
Sv 68-3601	24.8	22.2	8.12	6.40	8.49^{x}
Sv 68-3603	24.7	19.0	9.06	6.91	10.37^{x}
Sv 68-3612	23.1	20.1	7.90	6.69	48.52^{x}
Sv 68-3618	22.3	20.7	6.20	6.21	12.19^{x}
VARRYBS					
Sv 68-320	18.1	13.0	10.98	7.20	58.58^{xx}
SAREPTA SENAP					
I.L. 2317	21.0	16.3	10.46	7.24	625.77^{xxx}
I.L. 2319	20.4	15.6	-	-	59.31^{xx}
VARRAPS					
Sv 68-255	15.7[1]	14.6	8.58[1]	6.83	3.30^{o}
HOSTRAPS					
Sv 68-486	13.8[1]	13.0	8.78[1]	7.62	4.44^{o}

1 The sample is a mixture of seeds with brown and yellow seed coat.

NEW DEVELOPMENTS IN PLANT BREEDING - QUESTIONS AND ANSWERS

1) QUESTION: I wonder what some of our friends from other countries feel about the large-seeded types, that we have in the varieties Nugget, etc.? Is this large-seeded type a desirable thing, and if so would it be worthwhile from the plant breeder's point of view to try to develop large-seeded types in such varieties as Oro?

ANSWER: (Dr. G. Robbelen)

There is no doubt that selection goes towards large-seededness, because large seeds generally contain a lower fiber content and higher oil content, but how far we can go, is of course, the problem which we cannot forecast.

2) QUESTION: I understand that in the Bronowski type of rapeseed the aim is to reduce the glucosinolate content by selection. What shall we strive for? Is it about 2% the normal? This, of course, is a matter of how much we want to add to the feed formulations? What is the possible maximum for selection?

ANSWER: (Mr. B. Loof)

We have also asked this question: how low should we go in the selection of glucosinolate content? Nobody can answer this question, and the only answer I got was, that every lowering is desirable. If you could remove it completely it would be best, but if you could just reduce it as much as possible that is also acceptable.

FURTHER COMMENT (Dr. G. Robbelen)

Well, this is right only to a certain extent, because the Bronowski type has very small seeds and a relatively low oil content compared to the large-seeded types. Thus, if you buy something on the one side you have to give something on the other. As you pointed out so excellently all these combinations do not only take time and expense but they are also always only a compromise. This is not really just an analytical question but it is the matter of the objective, i.e., what compromise do we want? What we start to do now in plant breeding, will bring rewards only after ten years or more. Industry and the marketing people should closely cooperate with us, and not as in the past, tell us every year or two something new. As plant breeders we cannot follow as quickly.