BREEDING CARAWAY FOR NON-SHATTERING SEED

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ABSTRACT

The present varieties of caraway have shattering seeds which may lead to considerable yield losses. If through breeding the character non-shattering seed could be added to the existing favourable properties, the harvesting methods could be simplified essentially. This would be of real advantage in the areas of cultivation.

In the literature efforts to reach this objective have been described in detail. However, the material developed appeared not to be good enough in practice. Therefore the project has been tackled once more, since through the present shortage of labour in the areas of cultivation the growing of caraway might present difficulties.

Studies concerning its flower biology confirmed that caraway can be easily inbred so that a breeding programme can be simplified considerably. Seed setting can be greatly furthered by using flies for pollination. Genetic research showed that the character non-shattering seed is governed by one gene which is dominant.

1. INTRODUCTION.

Caraway, *Carum carvi* L., is a well-known crop plant in the Netherlands but of limited importance. Caraway is hardly grown outside our borders. It seems useful therefore to give some details first about its cultivation.

Caraway as an agricultural crop is known in the Netherlands for about a century only. Although its wild relative – from which the old local variety has been derived – has its natural habitat on the heavy clay soils along our large rivers, the crop is almost exclusively grown on marine clay soils. It is appreciated for several reasons on farms where cereals are grown preponderantly. This holds particularly for heavy soils. It is an early crop which is very suitable for the spreading of labour, since it is harvested prior to the cereals. In addition it has a good reputation as a preceding crop. For instance, in one of our northern cultivation areas called Oldambt (prov. of Groningen) caraway has got a fixed place in the crop relation scheme, also for reasons of maintaining the soil fertility.

The cultivation area of caraway is subject to fairly great fluctuations since prices of the seed may vary considerably, even in one harvest year. The seed is sold on a speculative basis.

The crop is a biennial which enlarges the speculative character. It is customary to plan a new area after the sales of the seed. The average cultivation area as considered over many years is some 4,000 ha. An extension of this average is not to be expected because the demand for the seed is completely fixed. An annually returning export of...
some 6,000 tons of seed can be realized in the Netherlands. This fairly stable need is also the reason why there is a free play between price and supply within our borders.

The seed is largely exported to the USA and West-Germany. It is used there as a spice in preparing special bread and pastry, for canning of vegetables, preserving gherkins, and to a small extent also for medical purposes. For a wider scope the oil content is not considered. In the Netherlands until recently only 10% of the annual production has been purchased by kümmel works and by factories using the constituent limonene of the caraway oil for the production of soap and perfumes. The volatile oil content is highly variable, fluctuating between 1 and 6.5%. Only lots with contents exceeding 3.5% are of significance for the kümmel-factories. At the moment the fabrication to oil has been discontinued in the Netherlands.

Growing caraway as a commercial crop is also hazardous because its seed production is not reliable. For instance the average production in 1960 was 1,150 kg/ha, in 1961 it was 1,450 kg/ha, and in 1962 1,750 kg/ha. The latter amount represents about the average over many years. One of the reasons for this considerable variation is the property of caraway to shatter mature seed, especially during windy weather. The harvesting methods are adopted to this feature. The most customary method of harvesting, using a normal self Binder, is therefore preferably done by night or in the small hours of the morning. Yet there are considerable losses between the platform and the carrying-up canvasses, during the binding procedure, in throwing the bundles from the binding table, and in placing the caraway in sheaves, even if losses are reduced by placing a bin on the harvester to catch the seed. Opinions differ as concerns swath-mowing followed by threshing by means of a combine provided with a pick-up attachment. When the weather is favourable there is less loss of seed. Furthermore the method is less expensive and requires less labour.

The conventional method of harvesting involves seed losses of 5 to 10%, in windy summers even to 20%. A loss of 10% means a loss of 600 tons of seed. At prices of 100 to 150 guilders per 100 kg this comes down to an annual loss of 600,000 to 900,000 guilders.

If a non-shattering variety could be developed, not only considerable yield losses would be eliminated, but also new prospects of harvesting would be opened. As caraway is a typical crop for extensive farming, the number of man-hours per ha should be restricted. The harvesting method practised so far is very unsuitable because harvesting and threshing of caraway take 63 man-hours and 10 tractor-hours per ha, as against, for instance, 13 and 5 hours, respectively, in wheat. Saving man-hours is by far the most important economization since in the future labour supply will become worse rather than better. According to NIEUWENHUYSE (1962) a simplification of the harvesting method comes down to saving 60 to 70 guilders per ha. He has based his calculations on work carried out by others, concerning binding, putting the sheaves in shocks or hedges and threshing with a combine from the shock or hedge, as compared with the round swath mowing and threshing from the swath by means of a combine provided with a pick-up attachment. However, assuming that non-shattering caraway can be directly threshed with a combine and taking the cost of this operation to be not higher than for a similar harvest method of cereals, the difference even amounts to 125 guilders per ha. For 4,000 ha this transfer in the method of harvesting may save 500,000 guilders. Even if a higher seed production might lead to lower prices – in