NOTES ON THE DEVELOPMENT OF A COMMERCIAL PRACTICAL SUNFLOWER VARIETY

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In developing a commercial practical sunflower variety we have to consider the following objectives:

1. High Yield of Seed
2. High Oil Content
3. Early Maturity
4. Non-branching
5. Short and Strong Upright Stems
6. Low Percentage of Husk in the Seed
8. Non-bending of the Heads

As a first step we collect material grown in the specific region and introduce some varieties, which would be adequate for the soil-climatic conditions of this particular region. Thus we have to consider the length of the growing season, to select for earliness and soil reaction (pH) from the point of view of susceptibility toward broom rape (*Orobanche cannis*), because at neutral reaction this disease is at its optimum. The varieties have to be planted in small spaced isolated nurseries and the plants inbreds for six generations. During the inbreeding, we have to eliminate all heterozygous plants and those homozygous for the not-required recessive characters. During the inbreeding work, highly self-fertile plants have to be selected. As for self-fertility, sunflowers should be divided into the following groups:

1. Steril group
2. Slightly fertile group – not more than 100 seeds per head.
3. Fertile group:
   (a) 101—250 seeds per head
   (b) 251—550 seeds per head
   (c) 551—1000 seeds per head
   (d) over 1000 seeds per head

A special attention has to be paid to plants producing white
(colourless) pollen, because these plants have a very uniform well
developed receptacle (head).

The amount of pollen produced by the different varieties has
to be carefully checked, for the determination and choice of male
and female parents.

During the period of inbreeding, tests for combining ability of the
different varieties have to be made, as to obtain data for future
crosses. Seed from the third and fourth inbred generation should be
analysed for the percentage of husk, armoured coat, and oil content,
as non-visible characteristics. For selfing we use paper bags as
isolaters.

In the program of inbreeding, it is of importance to choose plants
from the self-fertile group because, according to literature, the
self-fertility increases in the seventh inbred generation. Meanwhile
in the self-sterile group it decreases. This inbreeding and selection
program has to be carried out until homozygosity is achieved.

To test the obtained inbred lines for combining ability, we should
select two tester strains in a modified top cross. Inbred lines having
low self-fertility could be tested as female parents and those highly
self-fertile but with good pollen productivity could be tested as male
parents. We could use the hand pollination technique in material
which was inbred for three to four generations. That would give
quick results, if the lines selected as testers have a wide enough
range of good combining ability.

After having obtained our inbred lines and tested for their
combining ability, we proceed with the Pedigree method. To do
the cross between our inbred lines, we select for the single cross
parents which have high combining ability, as determined from
yield trials. In doing the cross between our chosen lines, we do
not have to emasculate the female parents no matter how highly
self-fertile the plant may be, because the plant’s own pollen is slow
in effecting fertilization but the foreign pollen germinates and
effects fertilization more rapidly. Therefore, we can easily do the
controlled cross in applying the pollen of the male parent on an
isolated head of the female parents by means of a brush made from
a piece of cotton rolled on the end of a tooth-pick and dipped into
the pollen.

In sunflowers, the immunity (armoured coat) toward sunflower
moth is dominant (BB) over susceptibility which is mostly recessive
(bb). Resistance to broom rape (*Orobanche cannis*) is also a dominant
(AA) characteristic. As female parent, plants with a recessive
character should be used because of better showing the deficiency
in the segregating generations.

From here on we proceed with the further steps of the pedigree