

T1972TECH02

SELECTION FOR OIL YIELD BY NMR METHOD

Y. SHCHORI et G. NAVON (Israel)

After introducing NMR spectroscopy for oil test in seeds (1) it was shown to be, due to its non destructive nature, a successful method of selection for high oil content in corn (2). In sunflowers this method has been tested by Johnson and Zupancic et al (3,4) and we examined it as a tool of selection for higher oil content.

A random sample of 400 seeds from cultivar Peredovik (5), grown in commercial field under dryland conditions were tested for oil content by NMR method (the average oil percentage per seed was 41.8 % from dry weight of seed.) The instrument used was Varian HA-100 NMR Spectrometer. Integration in the HR Mode was repeated at least two times and the average value was taken. The reproducibility was better than 2 %. Each individual intact seed was vacuum dried and peeled. 5 mm NMR test tubes were used, sample height was adjusted so that the receiver coil was in the center of the tested kernel.

Since self incompatibility prevents selfing of individual plants, two seed groups were chosen with significant difference in their oil content. The first group contained the kernels of highest oil percentage from all kernels tested and the second group of kernels of lowest oil percentage. From each of the groups about 20 plants were grown, isolated in a net cage. Plants within each group were randomly pollinated by hand.

Sample of mature seeds from each individual plant head, in the two groups was tested again by the NMR method. Bulk sample of each group was also tested by Soxhlet method. Variance analysis between and within groups was carried out as well as multiple range test according to the Student, Newman & Keuls method.

In the parent sample no correlation was found between oil percentage in the kernel and seed size or husk percentage.

There was no detectable effect on seed germination of the NMR test procedure (germination was 90,4 %).

In the seeds of the progeny of the low oil group 36.0 % oil from dry seed was found and in those of the high oil group 42.9 %. Oil percentage of the peeled kernels was 52.8 % and 59.3 % respectively. These differences between the two groups were not found significant by the t test. The Multiple range test revealed significant differences between single plants within each group. Difference within plant variability was also found.

These preliminary results seem promising. We believe that by starting with larger parent populations or by several tests per plant in that population, greater and significant effects of selection can be achieved. Heritability test must be carried out to distinguish the genetical part from the general variability that is believed according to other data to be remarkable (6).

BIBLIOGRAPHY

- (1) CONWAY, T.F. & SMITH R.J. (1963) - Determination of fat in corn and corn germ by wide-line nuclear magnetic resonance techniques. in Developments in Applied Spectroscopy - Vol. 2 - Plenum Press, New-York, pp. 115-125.
- (2) BAUMAN, L.F. - CONWAY, T.F. & WATSON S.A. (1962) - Heritability of variations in oil content of individual corn kernels. Science 139, 498-499.
- (3) JOHNSON, F.K. (1964) - Sunflower breeding in Minnesota - First Inter. Sunflower Conf. A. & M. University, Texas.
- (4) ZUPANCIC J., VRSCAJ, S., PORK, J., LEVSTEK, I., ERZEN, V., BLINC, R., PAUSAK, S., EHRENBERG, L. and DUMANOVIC, J. (1967) - Transient NMR selection method in plant breeding - Acta. Chem. Scan. 21 - 1664.
- (5) Seed of this cultivar received in 1967 from College Station Texas.
- (6) SHCHORI Y., MUHAISEN A. and BEN-HERUT, Z. (1971) - Spacing of sunflower oil varieties under dryland conditions. (Hebrew) Gan Sadeh, Vemeshek 13, 313-314.