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# REGULATION OF THE SUNFLOWER PLANTS' CLOSE STAND DEPENDING ON THE MOISTURE RESOURCES IN THE SOIL

Heavy and stable (by years) farm crop yields, particularly those of sunflower, are to a decisive degree dependent on the identification of the limiting natural factor for a given soil and agro-climatic zone (moisture, heat supply, fertility, etc.). This also underlies the main principles of planning yields (I.S. Shatilov, 1974).

In Moldavia the limiting natural factor is the degree of moisture available for farm crops. The amount of the sunflower seeds' yield is largely influenced by the plants' close stand and their even distribution across the unit of area, which is also intimately linked with evaporation from the soil surface and the plant transpiration. Excessive moistening coupled with insufficient moisture supply tend to rapidly exhaust soil moisture resources and cause the too dense crops to "burn out" (I.I. Sinyagin, 1975). Many experiments conducted by the VNIIMK and the network of its branches in various soil and agro-climatic zones have helped to establish that the more there is moisture in the soil and the greater the number of plants, the larger is the sunflower seeds' yield (A.I. Lukashov, 1960; D.N. Belevtsev, 1962).

When there is a shortage of moisture the more productive are the plants grown on the greater area of nutrition.

During a number of years we have conducted experiments on Moldavian chernozems to establish correlation between the resources of productive moisture in the soil, the plants' close stand and sunflower yields, so as to find whether it is possible to obtain maximal yields by regulating the number of plants per unit of area, since in the arid regions increases in the area of nutri-

tion is the only means of improving the plants' water supply.

Analysis of precipitation distribution during the period of vegetation has shown that there is no dependence between the amount of precipitation by months, their total during the vegetation period and the optimal sunflower density each year (Table 1).

Table 1

Distribution of Precipitation over the Vegetation Period and the Optimal Density of Sunflower Seedlings

| Year and the most rational density of plants per hectare | Precipitation in months, mm | | | | |
|---|---|---|---|---|---|
| | V | VI | VII | VIII | total |
| 1971 - 60,000 | 43.6 | 77.0 | 71.1 | 32.7 | 224.4 |
| 1972 - 40--50,000 | 92.5 | 113.9 | 74.2 | 55.4 | 336.0 |
| 1973 - 60,000 | 57.2 | 5.9 | 73.1 | 14.9 | 151.1 |
| 1974 - 30,000 | 91.1 | 104.8 | 69.3 | 14.7 | 279.9 |
| 1975 - 30,000 | 67.6 | 44.7 | 153.4 | 20.4 | 286.1 |

Insufficient moisture in the soil during sowing is little compensated by precipitation over the vegetation period.

As can be seen from the data adduced, considerable precipitation over the sunflower vegetation period in 1974 and 1975 failed to assure heavy yields with large density, because there was too little moisture in the soil during sowing.

Neither there is any correlation between the distribution of precipitation during the agricultural years and the close stand (Table 2).

Table 2

Distribution of Precipitation Over the Seasons and the Optimal Density of Sunflower Seedlings

| Years and the most rational density of plants per hectare | Precipitation | | | |
|---|---|---|---|---|
| | autumn, winter, spring | winter, spring | during vegetation | total for agr.year (average rate is 476 mm) |
| 1971 - 60,000 | 270 | 194 | 224 | 494 |
| 1972 - 40--50,000 | 276 | 124 | 336 | 612 |
| 1973 - 60,000 | 369 | 154 | 151 | 520 |
| 1974 - 30,000 | 183 | 128 | 280 | 463 |
| 1975 - 30,000 | 294 | 124 | 286 | 580 |

Analysis of precipitation distribution (Tables 1 and 2) shows that for the zones with a shortage of precipitation and its uneven distribution during vegetation, the amount of moisture in the soil prior to sunflower sowing is the most important and often decisive factor of the seeds' yield (Table 3).

When there are insufficient moisture resources in the soil too dense crops are worse off in terms of water supply than crops with the optimal density of stand. This is especially so during blooming and the seeds' formation. Soil moisture can only be more rationally used with an optimal area of nourishment.

The plants' provision with moisture is the main factor behind an optimal area of sunflower nutrition, owing to which the choice for the

Table 3

Productive Moisture in the Soil During Sowing; the Closeness of the Plants' Stand and the Yield of Sunflower Seeds

| Year | Amount of moisture in the soil (mm) per layer (cm) | | Seeds' yield (c/h) with the plants' density per hectare in thous | | | |
|---|---|---|---|---|---|---|
| | 0-100 | 0-160 | 30 | 40 | 50 | 60 |
| 1971 | 148 | 243 | 19.9 | 24.2 | 24.9 | 26.7 |
| 1972 | 107 | 160 | 22.9 | 25.9 | 26.7 | 25.8 |
| 1973 | 158 | 262 | 27.5 | 28.2 | 29.8 | 30.4 |
| 1974 | 97 | 122 | 18.1 | 15.8 | 15.5 | 15.0 |
| 1975 | 94 | 117 | 13.5 | 10.9 | 10.4 | 11.4 |

seedlings' density should be made with an eye for the moisture resources by the moment of sowing. Even in 1974 and 1975, which were most unfavourable as regards moisture supply, differentiation of nutrition areas according to the spring moisture resources in the soil helped to increase the seeds' yield by 2.3 to 2.6 c/h.

In the years with a poor resources of productive moisture in the soil layer 0-160 cm (100-120 mm) at the moment of sowing, bountiful yields were assured by the stand of 30,000 plants per hectare; 150-160 mm of productive moisture give the optimal yields with 40,000 plants per hectare, and if there is 200 to 250 mm of moisture the stand density should be increased to 50,000-60,000 plants per hectare.