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## WATER BALANCE IN VERTISOL AT DIFFERENT STAGES OF SUNFLOWER DEVELOPMENT

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Water balance of the vertisol soil at different stages of development of sunflowers grown on it was analysed in the eastern part of Yugoslavia (eastern Serbia). The trial included the sunflower hybrid NS-H-26 grown in three densities: 55.000, 47.600, and 31.200 plants/ha.

Water balance in the soil was analysed at the following stages of sunflower development: a) from emergence to 3-4 pairs of leaves, b) from 3-4 pairs of leaves to budding, c) from budding to flowering, and d) from flowering to maturity. The experimental plot was not irrigated and the sunflowers used water coming from rainfall and soil reserves. The dynamics of soil moisture was followed in the soil layer 0 - 100 cm.

The content of soil moisture in the layer 0 - 60 cm differed in dependence of the year and the stages of plant development. At the beginning of vegetative season, the soil moisture was regularly about 80-85% FWC to decrease gradually in the course of the season in dependence of the amount of rainfall. In 1977 and 1979, the soil moisture dropped below the level of availability to plants at the stage of flowering, to reach the wilting point at the stage of seed filling. At the end of the seasons, the rainfall increased the content of soil moisture above the level of availability. In 1978, the soil moisture went below the availability level already at the stage of budding, to reach the wilting point at the stage of seed forming. This condition lasted till maturity. The soil moisture below 60 cm was regularly available to plants. In the course of dry spells when the wilting point was reached in the rhizosphere, the sunflowers were forced to take up water from deeper soil layers.

In the agroecological conditions of the experiment, the 3-year average evapotranspiration of sunflower was 280 mm. Water deficit in relation to potential evapotranspiration was thus about 120 mm or 30%. The water uptake depended on the amount and distribution of rainfall in the course of the season. The actual figures of ETP ranged from 261 to 302 mm. Regarding the structure of water balance of sunflower, 98 mm or 35% were taken up from the soil reserves and 182 mm or 65% from the rainfall. The actual figures per experimental years were 87, 121, and 89 mm from the soil reserves and 193, 140, 213 mm from the rainfall. The lowest amount of water from the soil reserves was taken up to the stage of 3-4 pairs of leaves, only 3 mm on the average, because of large rainfall during that period from 3-4 pairs of leaves to budding, the uptake of water from the soil reserves increased to 50 mm or 56% of the total uptake for that stage. At later stages, the portion of water from the soil reserves kept decreasing while the portion of water from the rainfall increased.

The average yield of sunflowers was 2,977 kg/ha. The annual figures were 3,710, 2,541, and 2,681 kg/ha. The yield depended not on the rainfall alone but on a complex of environmental factors as well as the density. The highest yield was realized with 47,600 plants/ha, 3,262 kg/ha on the average, 20% and 10% larger than the yields realized with the densities of 31,200 and 55,500 plants/ha, respectively. The absolutely highest yield of kg/ha was realized in 1977 with the density of 55,500 plants/ha, the absolutely lowest yield of 2,607 kg/ha in 1978 with the density of 31,200 plants/ha. The average oil content was 46,90%. The density did affect the content of oil, the highest content being realized with the largest number of plants. The actual figures for the three variants of stand density were 47,27%, 46,88%, and 45,57%.