DISTRIBUTION OF INCIDENT LIGHT ENERGY IN SUNFLOWER CROP

T. Ćupina, Z. Sakač, M. Plesničar, D. Saftić and F.Ach
Faculty of Agriculture, Institute of Field and Vegetable Crops, 21000 Novi Sad, Yugoslavia.

A gybrid NS-H-43 and its parental lines OCMS-22 (♀) and RHA-SNRF (♂), and a hybrid NS-H-26-RM and its parental lines CMS-HA-V-8931-3-4 (♀) and RHA-58 (♂) were the subject of this investigation. The experiments were performed at the experimental field of the Institute of Field and Vegetable Crops at Rimski Šančevi.

The following parameters were measured: 1) global radiation above sunflower conopy, 2) reflacted radiation above sunflower canopy, 3) total incident radiation at the level of soil surface in sunflower crop and 4) total reflected radiation at the level of soil surface in sunflower crop. These parameters were measured from the emergence till the harvest of the sunflower crop. The dynamics of dry mass accumulation and distribution in plant organs was also followed in the course of vegetation.

The distribution of incident light energy in the sunflower crop is as shown in the scheme:

- 20% of incident light energy are reflected by the crop (canopy),
- 55-59% are absorbed and transformed in thermic energy necessary for the regulation of transpiration,
- 20% of incident energy are transmitted by the crop,
- 1-5% of incident energy are chemically bound energy. (Fig. 1).

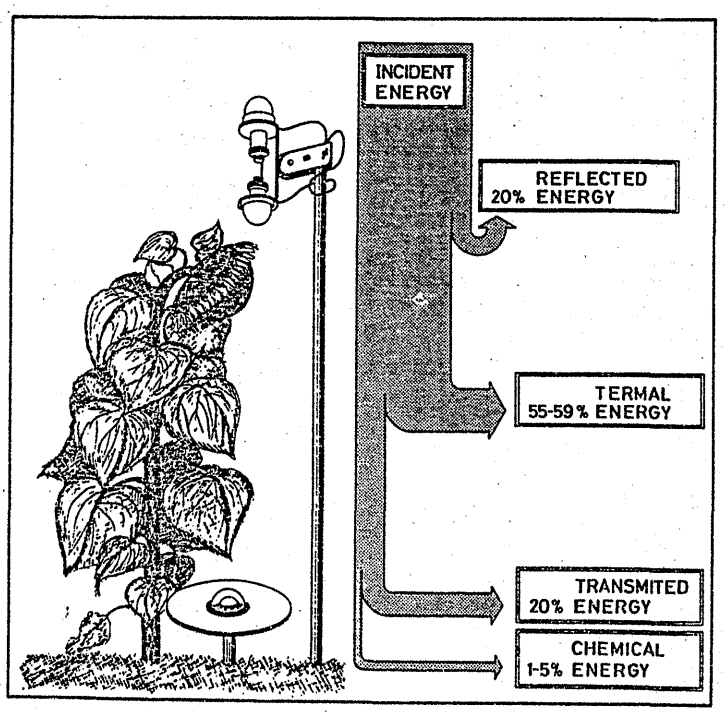

Figure 1. Distribution of incident light energy in sunflower crop.

The efficiency of solar energy utilization by individual plants or sunflower crop (*per unit area*) was defined by the following ratio:

$$\frac{\text{chemical energy of dry plant mass (MJ)}}{\text{incident photosynth. active radiation /MJ)}} \times 100$$

Chemical energy bound in plants and plant organs was measured by the calorimetric method.

The obtained results show that the examined sunflower genotypes had different efficiencies of light energy utilization. The hybrid NS-H-43 had the highest efficiency of light energy utilization while the line OCMS-22 (♀) exhibited the lowest efficiency. The efficiency of light energy utilization increased from the stage of flower bud to the stage of wax maturity. The distribution of dry mass in different plant parts varied depending on the stage of development and genotype (Fig. 2).

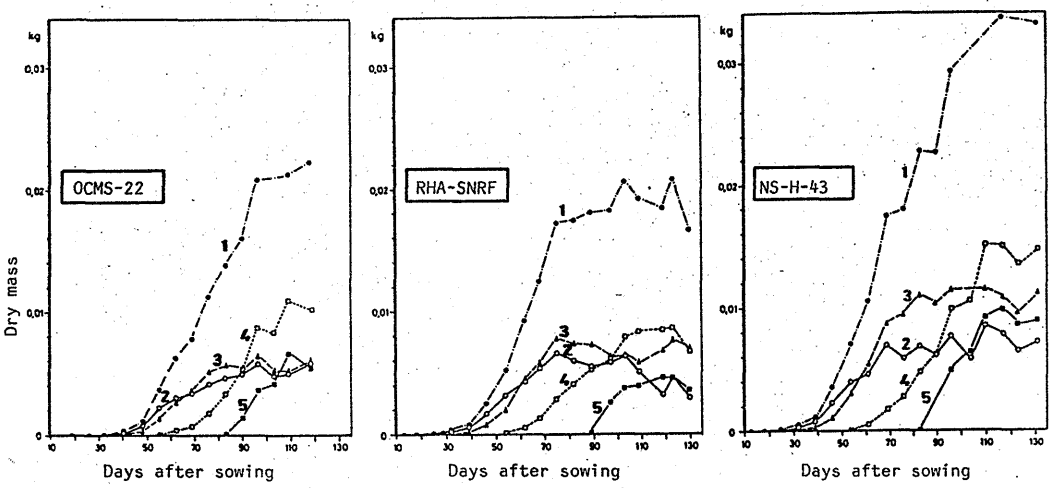

Figure 2. Dynamics of dry mass distribution in different plant parts for hybrid NS-H-43 and its parental lines OCMS-22 (♀) and RHA-SNRF (♂). 1) whole plant, 2) leaves, 3) stem, 4) head, and 5) seeds.

Efficiency of light energy utilization by the sunflower crop varied depending on biotic and abiotic factors. In respect to that it was necessary to solve the following problems: 1) determination of distribution pattern of incident light energy in sunflower crop in the course of vegetation, 2) measurement of optical properties of sunflower crop and their changes in the course of vegetation, 3) determination of leaf geometry for sunflower genotypes in different phases of plant development, 4) determination of light energy transmission pattern in different strata of sunflower crop, as a complex optical and geometric system, in dependence on eclogical factors.
If the above mentioned problems were solved, it would be possible to get answers to the following questions: 1) what amount of light energy is necessary for the formation of a certain yield level, 2) what should be the efficiency of light energy utilization in order to obtain this yield, 3) which crop density and dynamics of leaf area growth secure in maximum efficiency of light energy utilization, 4) the geometry of leaves in an ideal sunflower crop and 5) possibilities of increasing light energy utilization by sunflower crop.

MORPHOLOGICAL OBSERVATION AND ONTOGENESIS OF THE Y_BRANCHED CHARACTER IN SUNFLOWER

Siu Gong-she, Liu Li-yun, Tort Maryse*
Institute of Botany, Academia Sinica, Beijin, P.R. China
* Laboratoire Biologie et Physiologie Vegetales, 63038 Clermont-Ferrand, France.

Y-branched character (on the genotype WJR) is realised directly by the observation in the field. The sections of shoot apex are prepared with the histo-cytological method. The results show that: 1) The level of the bifurcation is variable, it takes place more frequently at the middle of the stem, the bifurcation appears never below the first pair of leaves, it could manifest at the capitula; 2) The phyllotaxis of the same genotype is complex (3-5 leaves on the same level of the stem), it expresses more frequently than the Y-branched character, the two characters are genetically linked; 3) Four regions are distinquished to describe a Y-branched plant: (a) the base of the stem with two helix "helice foliaire", (b) the region with leaf helix number increasing rapidly, which may reach up to as many as 5 or even sometimes 7, (c) the region of the bifurcation, near one node, the disposition of which is very variable, (d) the tip of the plant, it is characterized by the appearance of 2 or more axes from one or more bifurcations and each axe includes less leaf helix number, 4) The Y-branched character is not axillary but results from division in 2 or 3 parts of the apical meristem of the stem, this division (called bifurcation) shows an original character in comparison with the dissociation and the dichotomy: cell necrosis occurs at the axial zone of the apical meristem, any structure of Y-branched character is not observed at the seeds.