

AN EVALUATION SCALE FOR BROOMRAPE (*OROBANCHE CUMANA* WALLR.) RESISTANCE OF SUNFLOWER BREEDING MATERIAL

ROSSITSA BACHVAROVA

Institute for Wheat and Sunflower
General Toshevo, Bulgaria

In the course of the breeding process, when evaluating the reaction of sunflower plants to broomrape, all selections fall into two categories: resistant and susceptible. In some cases, the attack is expressed only as a strong or weak one, without any objective criterion for that.

Some research workers (Iliescu, 1973) suggest the use of a complex index of resistance, involving the frequency and the intensity of the attack. The values of this index, obtained by the author of this paper, vary between 0.2 and 38.0, but they create difficulties in grading the material used for breeding and seed production purposes.

V. S. Pustovoit (1966) proposed to calculate the "damage rate" index by dividing the number of the broomrape stems to the number of the parasitized sunflower plants and excluding those plants that remain undamaged, though broomrape seedlings may occur. The obtained value is multiplied by the percentage of the broomrape attack.

This method of evaluation also creates certain difficulties in sunflower breeding for resistance to broomrape.

For this reason it has appeared necessary to establish a scale for the objective determination of the broomrape genetic resistance, which would guarantee the juxtaposition between the results obtained by cultivars and years. Such a scale is necessary for seed production too, where the resistance to broomrape must be carefully tested.

The attack rate is taken as a basic criterion in constructing the scale, and it is expressed by the number of broomrape plants developed per one sunflower plant. The general development of the parasite is taken also into consideration.

The examination of the results obtained with 8 sunflower open-pollinated varieties and 13 self-pollinated lines, inoculated under field conditions with the local broomrape population using Pustovoit method, permits to suggest the following five rates (Figure 1, *a-e*):

0 — immune: no broomrape plants occur on the host roots;

1 — highly resistant: above the ground appears a single, undergrown broomrape plant, forming single flowers whose pericarp contains either a few seeds or even none, due to the withering stem;

2 — low susceptible: on the host roots appears a single well-developed broomrape plant which reaches its full maturity;

3 — moderately susceptible: on the host roots appear 2—4 broomrape plants of high viability with more than 15 flowers, forming a great number of seeds;

4 — highly susceptible: more than 5 well-developed broomrape plants can be noted on each sunflower plant.

Sunflower selection highly resistant (rate 1) may be used, because the broomrape attack is usually of no effect on sunflower development and yield. At the same time, the parasite plants

In breeding or seed production works, one must select plants falling into the rates 0 and 1. do not contribute to a high infection of the soil, as they develop single flowers with a small number of seeds.

All plant materials falling into the attack rates 1, 2 and 4 must be excluded from any breeding and seed production works.

The use of this scale is of a great help for testing sunflower resistance to broomrape in greenhouses and phytotron too.

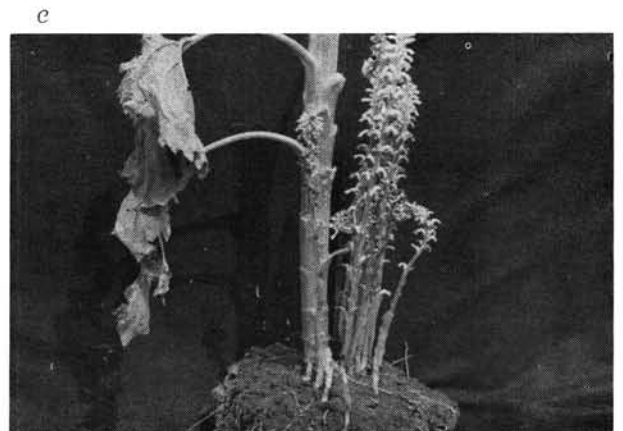
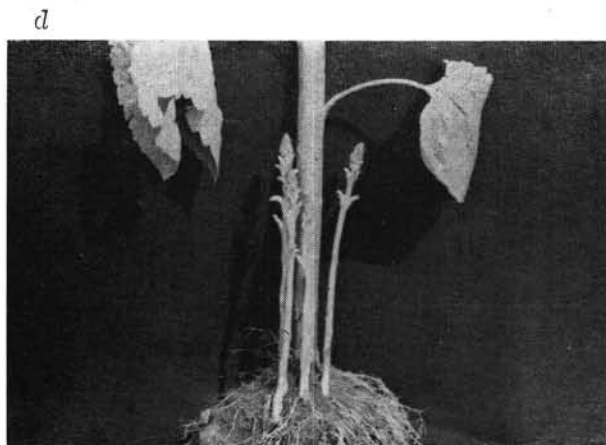
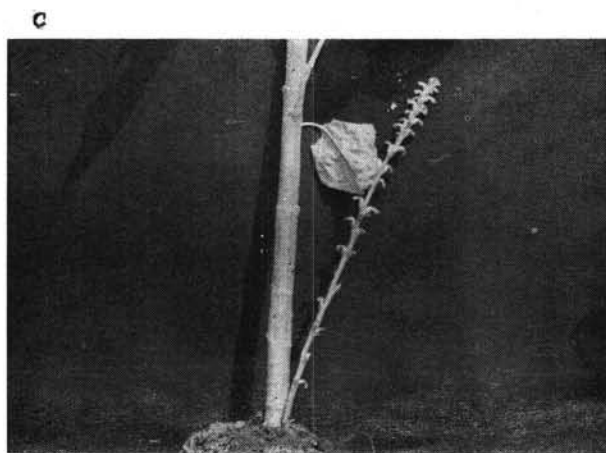
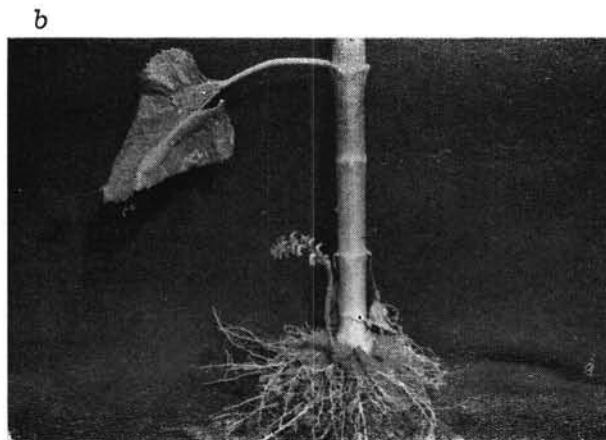
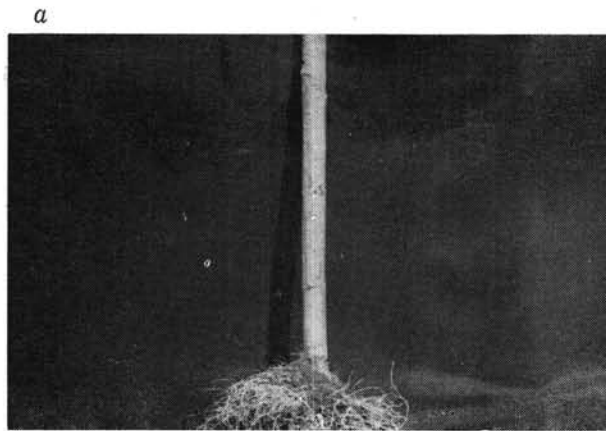


Fig. 1 — Evaluation scale for broomrape resistance, using Pustovoit testing method :

a — immune (grade 0); b — highly resistant (grade 1); c — low susceptible (grade 2); d — moderately susceptible (grade 3); e — highly susceptible (grade 4).

On the basis of a great number of selections inoculated and tested by Panchenko method (1975), an evaluation scale of three rates has been developed, as follows (Figure 2, a-c) :

0 — immune : no broomrape tuberosity is present on the roots of 20 plants, in two replications, 45 days after sunflower germination ;

1 — highly resistant : only feeble broomrape tuberosities of 1 mm each are visible, 45 days after sunflower germination ;

2 — highly susceptible : many well-developed broomrape plants are growing on the roots of each sunflower plant.

The application of these scales of evaluation will allow an objective classification of the tested breeding material, which would lead to a much more effective selection work.

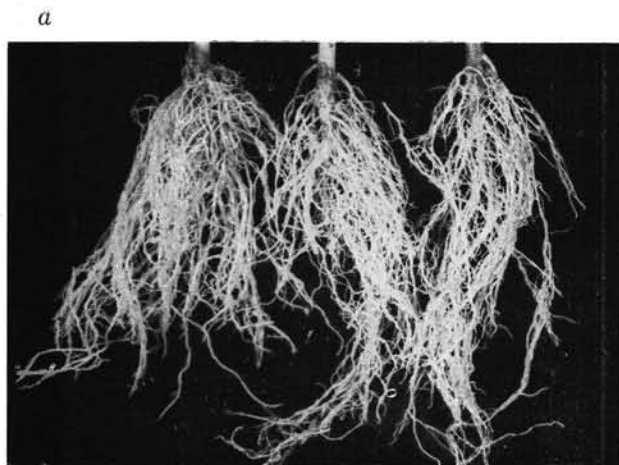
REFERENCES

- Iliescu H., 1973, *Reaction of sunflower cultivars to broomrape (Orobancha cumana) attack (in Romanian)*, An. I.C.C.P.T., XXXIX, C, 261—266.
- Panchenko A. I., 1975, *A screening method of evaluating the breeding materials for resistance to broomrape*, Vestnik selskhoz. nauki, No. 2.
- Pustovoit V. A., 1966, *Selected works (in Russian)*.

UNE ÉCHELLE D'ÉVALUATION DE LA RÉSISTANCE À OROBANCHE CUMANA WALLR. DU MATÉRIEL D'AMÉLIORATION DU TOURNESOL

Résumé

En vue de la classification objective du matériel d'amélioration par rapport à son résistance à Oro-



banche cumana Wallr., on propose une échelle d'évaluation à trois graduations, ainsi :

0 — immunité : aucune tubérosité d'Orobanche n'est présente sur les racines de tournesol, 45 jours après la levée ;



Fig. 2 — Evaluation scale for broomrape resistance using Panchenko testing method :

a — immune (grade 0); b — highly resistant (grade 1);
c — highly susceptible (grade 3).

1 — très résistant : à peine quelques tubérosités faiblement développées d'Orobanche, d'environ 1 mm sont visibles 45 jours après la levée du tournesol ;

2 — très sensible : sur les racines de chaque plante de tournesol il y a de nombreuses plantes d'Orobanche bien développées.

UNA ESCALA DE EVALUACION DE LA RESISTENCIA AL JOPO (*OROBANCHE CUMANA* WALLR.) DEL MATERIAL DE MEJORA DEL GIRASOL

Resúmen

Con vistas a una clasificación objetiva del material de mejora en cuanto a la resistencia al Jopo (*Orobanche cumana* Wallr.) se propone una escala de evaluación con tres graduaciones, como sigue :

0. — immune : ninguna tuberosidad de jopo está presente sobre las raíces de girasol, a 45 días después de la germinación ;

1. — muy resistente : están visibles sólo unas tuberosidades de jopo, débilmente desarrolladas, de 1 mm, al cabo de 45 días desde la germinación del girasol ;

2. — muy sensible : en las raíces de cada planta de girasol crecen numerosas plantas de jopo bien desarrolladas.