VARIATION IN NODULATION CAPACITY OF PEA VARIETIES[1/]

Jensen, F. H. Pajbjergfondan Plant Breeders
Dyngby, DK-8300 Odder, Denmark

In a program to study variability in root development, 398 pe;
varieties and breeding lines were screened at Pa j bjergf onden (3). At the same time root nodulation was also determined.

The plants were grown in 30 cm long PVC tubes, 10.2 cm diameter, buried at random in the field with three replicates. The medium was soil containing natural Rhizobium strains. The experiment included 38 colored flowered peas, 148 white flowered peas, and 2 12 garden peas. The plants were harvested after 75 days of growth (beginning to end of pod filling) Total root length was determined using the line intersection method (4), Nodulation was classified, using a scale of 0-5 (fewer categories compared to Brockwell [1]).

Figure 1 shows the results of the nodulation classification. The colored flowered peas in general nodulated well (score 2-5) and also had large root systems (3). The white flowered dried peas and garden peas in general nodulated rather poorly (score 0-3) and had smaller root systems. This finding corresponds to that of Gelin and Blixt (2). Among the white flowered dried peas it was possible to separate the material into different groups, e.g. varieties and breeding lines from Mansholts Vered1ingsbedrijf Holland, showed very poor nodulation (score 0-2), while in general Swedish varieties (from Weibullsholm and Svalof) exhibited relatively good nodulation (score 2-4).

Within these two groups the breeding material is genetically very similar (common origin), and as described by GeIin and Blixt (2) the average nodulation is genetically controlled by at least two genes (nod-1 nod-2). The difference in nodulation between these two groups is therefore likely to be of genetical origin.

Nodulations with effective Rhizobium strains and N-fixation capacity are normally closely related. Rydberg et al. (6) found a very low nitrogenase activity (acetylene reduction) in 'Bodil' (from Mansholt) compared to a group of Svalof lines, which were the same as those used in the present study.

Figure 2 shows the correlation between total root length and nodulation for the 398 pea varieties.

Richter (5) found a positive correlation between nodule number and root dry weight at the beginning of flowering and at seed maturity with coefficients of 0.72 and 0.52, respectively. In the present experiment there also was a highly significant correlation (r=0.59) between nodulation and total root length.

On a large root system there will be more sites for infection of the Rhizobium bacteria, but often there is also i general positive correlation between total root length and top dry weight. This correlation influences the distribution of assimilates.

For the plant breeder in a country where N is not a critical cultural limitation, the search for varieties with more optimal root/top ratio will be more urgent than for high nodu Lit i no, varieties.

1/ This work was supported by the Danish Agricultural Research Council.

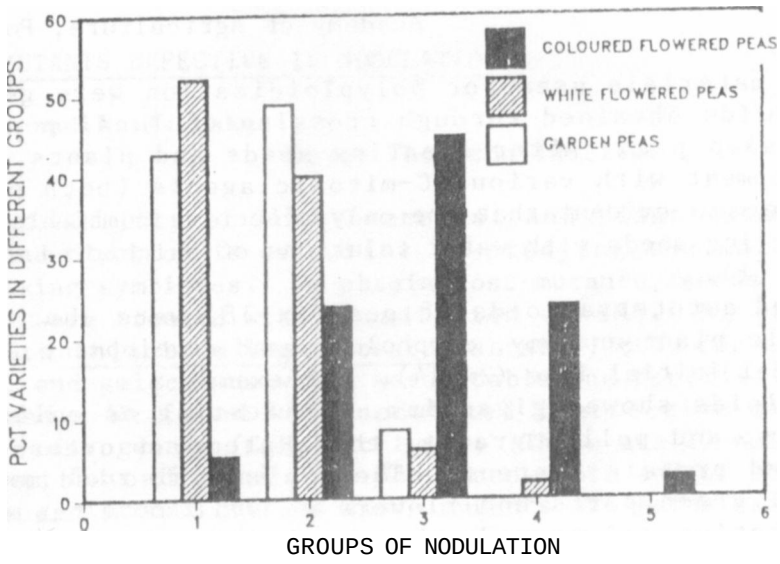

Fig. 1. Nodulation of peas divided into groups.

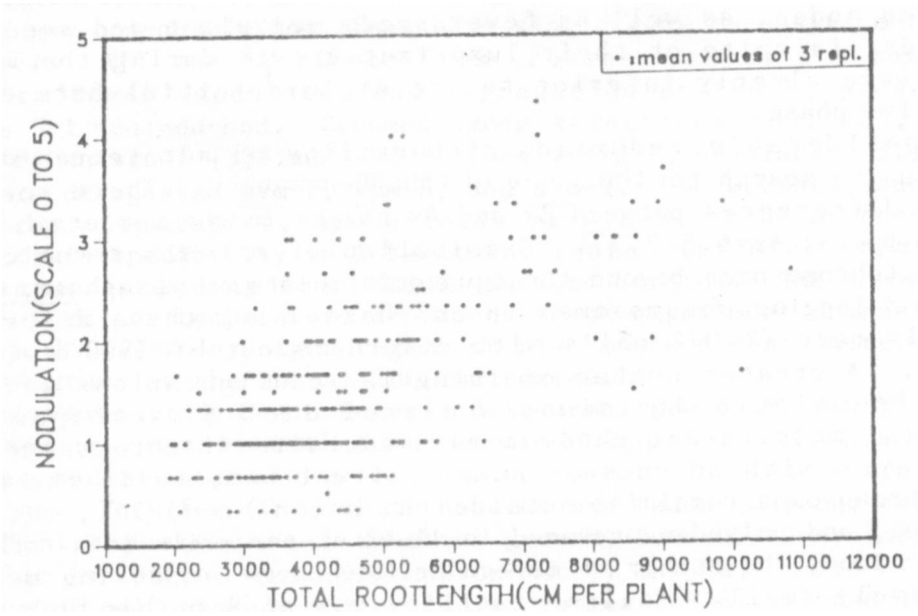

Fig. 2. Correlation between total root Length and Modulation.

1. Brockwell, J. 1980. In Methods for evaluating biological nitrogen fixation. Bergersen, F. J., ed. pp. 417-488.
2. Gelin, 0. and S. Blixt. 1964. Agri Hort. Gen. 22:149-159.
3. Jensen, A. 1985. Report, Pajbjergfonden, 118 pp.
4. Newman, E. I. 1966. J. Appl. Ecol. 3:139-145.
5. Richter, E. 1974. Landwirtsch. Forsch. 27:330-342.
6. Rydberg, I., N. 0. Bertholdsson, and V. Stoy. 1985. Report, Svalof AB, 65 pp.

*****