Pak. J. Bot., 15 (2): 69–72, 1983.

# VEGETATIVE REPRODUCTION IN RAPESEED BREEDING

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**Abstract**

A sexually propagated crop, which can also be reproduced vegetatively, provides several advantages such as seed increase in $F_1$ and early segregating generations and conservation of gene pool. Week old seedlings of *Brassica napus* cv. Erglu were transplanted and after 6 weeks one series of individuals was allowed to grow to maturity. In a second series cuttings from 4 nodes on the main axis were inserted in soil without rooting powder and stump was allowed to grow. Out of 72 all but 3 cuttings started growth. Pods from a plant and 5 clones from a single individual were threshed together, seed weight measured and data put to analysis of variance. Significant difference were found between the two treatments. As the rapeseed can be vegetatively propagated, this method may be used to increase seed of plants or strains which are poor seed producers or to establish clones and maintain original plants used in a strain/synthetic variety.

## Introduction

Mode of reproduction is very important in breeding programme of a crop. If a crop is normally sexually reproduced but can also be vegetatively propagated, vegetative reproduction may in certain situations be used with considerable advantage (Poehlman & Borthakur, 1960). In situations where seed set is very poor, the number of $F_1$ plants can be increased by vegetative reproduction to provide an increased amount of $F_2$ seed. Using vegetative reproduction, a particular desirable plant in a back-crossing programme can be retained for use over several generations of crossing. Vegetative reproduction is also advantageous for rapid increase of and for the maintenance of purity in breeders seed. Sterile material, which can arise as a result of mutation, cytoplasmic male sterility or interspecific cross, can be propagated and maintained for a long period to allow investigation and to practise possible alternative crossing techniques. Physiological studies, e.g., photoperiod response of a single plant can be carried out by growing cuttings at different photoperiods. Using vegetative reproduction individual genotypes of a genebank can be maintained indefinitely for genetic conservation. This method can also be used to establish clones and maintain original breeder's material as for example that used in synthetic variety production.

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In oilseed rape *(Brassica napus)* Thompson (1974) successfully used stem cuttings to provide clones from polyhaploids isolated in the field at flowering. We here report the results of a detailed examination carried out to compare the yield of seed obtained from single plants grown to maturity and plants of the same variety cloned by vegetative reproduction during preflowering growth.

## Materials and Methods

Seed of the summer rape *(B. napus f. annua)* cv. Erglu was sown in 15 cm x 10cm x 4cm plastic tray. Week old seedlings were transplanted into John Innes No. 1 potting compost in 10 cm and 15 cm diameter plastic pots in an unheated greenhouse with 16 hours day-length, normal day light being supplemented with 400 watt mercury vapour lamps. The experiment was laid out in a randomized complete block design with three replications, a replication consisting of 12 pots (six pots of each size).

All seedlings were grown for six weeks until approximately one week before flowering commenced. One series of individuals (3 plants in each replication) was allowed to grow to maturity. In a second series cuttings were taken from the terminal 4 nodes on the main axis of each plant by cutting diagonally through the main axis with a sharp scalpel. Cuttings were inserted in pots of the same size containing John Innes No. 1 compost without rooting compound treatment. Thus each individual plant consisted of five clones. All cuttings and stumps were re-randomized within three blocks. All plants and clones of both the series were watered regularly and supplied weekly with a 1% solution of a commercial plant nutrient preparation (Fisson, 1N : 1P : 1K).

Pods were collected at four different dates as the maturity was not synchronous in both the treatments. All pods from a plant and the 5 clones from a single individual were harvested together and threshed by hand. Seed weight was taken and data subjected to analysis of variance (Steel & Torrie, 1960).

## Results and Discussion

All but three of the cuttings began growth immediately, death of the 3 may have been due to infection of cut ends in the soil. Subsequent growth of the cuttings was normal. Terminal cuttings matured earlier than lateral and maturity was reached at approximately the same time as in the plants derived from seed.

Mean seed weight from seedling derived and for vegetatively reproduced materials and analysis of variance of the data per treatment is given in Table 1. Significant differences were found between the two treatments at $P<0.05$.

Maximization in the amount of seed available in early segregating generations can

**Table 1. Mean total seed weight (gm) produced from seedlings grown to maturity (Treatment 1) and from 5 clones taken from each of 3 seedlings (Treatment 2) after six weeks growth in John Innes soil.**

| Density | Treatment 1 | Treatment 2 | Mean |
|---|---|---|---|
| 10 cm diameter pot | 0.8313 | 1.6977 | 1.2645 b |
| 15 cm diameter pot | 2.9833 | 6.8630 | 4.9232 a |
| Mean | 1.9083 b | 4.2804a | |

Mean values in a row or a column with different letters differ significantly at P = 0.05.

Analysis of variance for total seed weight for the two treatments and two densities.

| Source of variation | df | SS | MS | Variance Ratio | Probability. |
|---|---|---|---|---|---|
| Blocks | 2 | 5.180 | 2.590 | 1.734 | 0.254 |
| Treatment (T) | 1 | 16.893 | 16.893 | 11.677 | 0.011 |
| Density (D) | 1 | 40.158 | 40.158 | 27.758 | 0.002 |
| T X D | 1 | 6.810 | 6.810 | 4.707 | 0.073 |
| Error | 6 | 8.680 | 1.447 | | |
| Total | 11 | 77.559 | | | |

be very important in a plant breeding programme. In some crosses among cultivars of *B. napus* it was observed (Munir, 1982) that hybrid seed obtained from some of the crosses between varieties was low due to poor seed set and had to be excluded from the diallel cross programme. Thus in oilseed rape larger amounts of $F_2$ seed can be obtained as a result of vegetative multiplication of $F_1$ plants than would be obtained from seed derived material. Though density effects were also significant but this technique has a clear advantage. The method could also be used to increase seed produced in subsequent generations and such material can advantageously be used in investigations of genotype-environment interactions, screening for resistance to different pests and diseases. Thus vegetative reproduction provides a method for multiplying desirable parent material, in favourable environmental conditions and may hasten the release of a variety. Since the rapeseed can be successfully propagated vegetatively the advantages to be gained by asexual (alongwith sexual) reproduction can be obtained.

**References**

Munir, M. 1982. Phenotypic and genotypic plasticity for yield and yield components in *Brassica napus* L. Ph. D. Thesis, The University of Liverpool.

Poehlman, J. M. and D.Borthakur. 1960. *Breeding Asian field crops.* Oxford and IBH Publishing Co. New Delhi.

Steel, R.G.D. and J. H. Torrie. 1960. *Principles and procedures of statistics.* McGraw Hill Book Co. Inc. New York.

Thompson, K. F. 1974. Sonderdruck 4 Internationaler Rapskongress, Giessen: 119-124.