



Research Paper

**Study of Fertility in some Varieties of Radish (*Raphanus sativus L.*)
and their Hybrids**

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Abstract- Different varieties of radish (*Raphanus sativus L.*) were studied on some parameters like days to flower, pollen fertility, mean number of ovules / pistil, seed and siliquae set and fertilization value to understand the genotypic difference between them. Some of their F₁ hybrids were found to be superior in these parameters in comparison to their parents.

Key words: - Fertilization value, Pollen fertility, *Raphanus sativus*

Introduction

Fertility is a complex character and depends on a number of biological processes such as development of ovules in the ovary, pollen grains in the anther, pollination and fertilization which ultimately lead to the formation of fruits and seeds. The seeds thus produced are expressed under the influence of the integrated effects of the genetic and environmental factors, which are of great importance in determining the stability and adaptability too Eberhart *et al.* (1966)^[1].

Crucifer crops are used as vegetables and also for the edible oil. The seeds are carminative and also yield an essential oil. Mean number of ovules (MNO) in the ovary and the mean number of seeds (MNS) in the siliquae are important parameters that may indicate genotypic variability within the varietal populations of a cross-pollinating crop like radish Dayal, (1986)^[2]. The aim of the study is to evaluate the Fertilization value (FV %) and other related parameters in the varietal populations (cultivars) and their hybrids.

Material and Methods

Four cultivars of radish such as Red Devil (RD), Icicle Short Top (IST), Japanese white (JW), and Rapid cycling mutant (CRGS-7) and their F₁ hybrids (RD x IST), (CRGS-7 x JW) and (RD x CRGS-7) served the materials for the present study. Seeds of Rapid cycling mutant were obtained through the courtesy of Prof. P.H. Williams, (Wisconsin). JW is an Indian variety and seeds were of obtained from

IARI (Pusa). Whereas RD and IST are American varietal populations (seeds were obtained through I. Panicker).

Seeds were sown in rows at a distance of 30 cm between two rows and 10cm between two seeds and were grown in the same field. From each row 10 plants were randomly selected among the cultivars and hybrids. 25 flower buds of the size 10-12 mm were collected from each of the plant simultaneously and fixed in 70% alcohol. The pistils were pressed between two microscope slides after putting a drop of 2% KI solution to count the number of ovules and to compute MNO. 100 siliquae from each plant were dissected to compute MNS. The ratio of MNS and MNO x 100 gave the percent fertilization value (FV %). Pollen fertility (PF) was studied with standard acetocarmine technique, about 5000 pollen grains were scored in each cultivar and hybrid. Days to flower (DTF) in the cultivars as well as in the hybrids were simultaneously recorded.

Results

(a) DTF

The study of days to flower in the present work is of much significance in plant breeding. The hybrids raised with rapid cycling mutant (CRGS-7 x JW) flowered in 63 days while (CRGS – 7 x RD) in 52 days.

(b) PF

PF was considerably high in the cultivars ranging from 86 % to 89 %. In the hybrids PF was slightly lower

ranging from 83.7 % to 87.5% which might be attributed to compatibility of the parents.

(c) MNO

The cultivars varied considerably among themselves in this parameter. IST had the highest MNO (11.3 ± 3.26) followed by RD (10.2 ± 3.28), JW (8.9 ± 1.45) and the lowest in CRGS – 7 (6.8 ± 1.02). Among the hybrids MNO was noted as 9.6 ± 6.72 in RD x IST, 6.7 ± 0.89 in CRGS-7 x JW and 7.1 ± 1.89 in CRGS-7 x RD.

(d) MNS

Cultivars and hybrids showed considerable variation with regard to MNS. The cultivars IST had highest MNS (8.6 ± 1.29) and, followed by JW (8.2 ± 1.02) and RD (7.8 ± 1.36) while CRGS – 7 had the lowest (5.2 ± 1.36). Among the hybrids MNS value was higher in RD x IST (7.1 ± 0.34) as compared to RD x CRGS (5.6 ± 0.27) it and CRGS – 7 x JW (4.2 ± 0.29).

(e) FV (%)

Among the cultivars, FV was highest in JW (83%) followed by IST (77.8%) and RD (73.4%). In the mutant, CRGS-7 it was noted to be (78.8%). Among the hybrids the lowest FV was recorded (62.4%) in CRGS – 7 x JW (62.4%) while the highest in RD x CRGS – 7 (78.8 %) however in RD x 1st (73.8 %).

The data were analysed statistically and have been shown in table -01.

Discussion and Conclusion

The present study indicates that the pollen fertility is almost constant in all the cultivars and their hybrids. The variation in MNO in the cultivars and the hybrids indicate their genotypic peculiarity. Prasad et al (1994)^[3]; Prasad and Shrivastava (1993)^[4] observed heterosis in this parameter in the hybrids of radish and turnip, however a little deviation was found in few cases in the present study which may be the result of genotypic variation.

Tokumasu(1967)^[5] and Popescu (1973)^[6] reported that in radish fertility is always higher when plants with higher number of chromosomes are used as female. Our results confirm that higher MNO is directly related with the MNS which has a direct impact on seed production. Although the oil content of radish is less as compared to Brassicas, however this particular root crop is characteristic that the vegetative top of the root can be cut and replanted to get the flowers and seeds .Thus double way yield of roots as well as seeds can be achieved. The study of these parameters may throw light to enhance the seed production in this crop.

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References

1. Eberhart,S.A and Russell, W.A stability parameters for comparing varieties. *Crop science* **6**:36-40(1966).
2. Dayal, N. Cytogenetics of the cultivated radish. *Indian Rev. Life Sci.***6**:41-66 (1986).
3. Prasad., C. and Dayal., N. Fertilization Value in Radish in two nodes of pollination. *Geobios New Reports* **13**:175 – 179. (1994).
4. Prasad ,C. and shrivatava ,M. Intervarietal hybridization and crossability studies in turnip. *Bionature*, **13**: 13-19, (1993).
5. Tokumasu., S. Crossability between triploid and tetraploid & the chromosome number of their progenies in *Raphanus* . *Mem Shimo Univ Sec VI. (Agric)* **12**: 99-128. (1967).
6. Popescu., I. Cytogenetic research about hybrids between 2x X 4x forms of *Raphanus sativus* L. *Ann Univ Bucew, Biol Ves* **22**: 175-181. (1973).

Table: 1: Mean and range of variability for morphological traits of fertility in cultivars of *R.sativus* and its hybrids Figures in parenthesis indicate range. RD - Red Devil , IST - Icicle Short Top , JW – Japanese White , CRGS-7 – Rapid Cycling Mutant , DTF – Days to flower , PF – Pollen Fertility, MNO – Mean Number of ovule , MNS – Mean No of Seeds , FV – Fertilization Value.

Cultivars / Hybrids	D.T.F.	P.F	MNO	MNS	FV (%)
RD	89 ± 1.38	88.6 %	9.8 ± 1.86	7.1 ± 2.81	
	87 ± 0.94	89.2 %	10.2 ± 3.28	7.8 ± 1.36	73.4 %
	(85 - 91)		(8.8 – 10.7)	(6.7 – 8.6)	
IST	78 ± 1.12	86.9 %	9.5 ± 0.049	7.5 ± 1.03	
	76 ± 1.03	87.6 %	11.3 ± 3.26	8.6 ± 1.29	73.4 %
	(74 - 86)		(9.1- 11.8)	(7.1 - 8)	
JW	91 ± 0.92	81.8 %	8.6 ± 1.32	8.0 ± 0.05	
	94 ± 1.32	82.7 %	8.9 ± 1.45	8.2 ± 1.02	83.1 %
	(89 – 98)		(8.4 – 9.1)	(7.8 – 8.6)	
CRGS- 7	49 ± 2.42	85.7%	6.8 ± 1.02	5.2 ± 1.36	
	48 ± 1.51	86.9%	7.3 ± 1.61	6.1 ± 1.81	78.8 %
	(87 - 52)		(6.4 - 7.6)	(5.0 - 6.9)	
RD X IST (F1)	79 ± 0.98	85.6 %	9.6 ± 6.72	7.1 ± 0.34	73.8 %
CRGS- 7 X JW (F1)	63 ± 1.23	87.5 %	6.7 ± 0.89	4.2 ± 0.29	62.4 %
RD X CRGS – 7 (F1)	52 ± 1.36	83.7 %	7.1 ± 1.89	5.6 ± 0.27	78.8 %