

STUDY OF POLLEN FERTILITY IN FIVE VARIETIES OF *IMPATIENS BALSAMINA*

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Abstract: *Impatiens* is a widely cultivated ornamental plant, belonging to family Balsaminaceae. Nearly 91% of Indian species of *Impatiens* are endemic. *Impatiens balsamina* L. also known as Gulmehndi is one of the popular species of North India. The present communication is an account of study of pollen fertility in different varieties of *Impatiens balsamina*. There was a statistically significant difference between varieties as determined by one way analysis of variance of pollen fertility indicates significant difference due to variety. The result showed that orange variety pollen fertility significantly highest from each of the other varieties and lowest in pink variety.

Keywords: *Impatiens balsamina*, Pollen fertility, varieties

INTRODUCTION

Impatiens balsamina L. (Gulmehndi, Balsam) is a commonly cultivated rainy season ornamental of India, belonging to family Balsaminaceae. This ornamental bears beautiful flowers which range in colour from red, purple, orange, pink and white. With a view to increase flower size and prolonging the blooming period (Bose and Mukherjee 1967; Raghuvanshi and Singh 1979). Many species of the genus *Impatiens* have different pollination biology (Mauda & Yahara 1994, McCall et al. 1994, Schoen et al. 1994). New cultivars are bred mainly by intersexual crossing of specie or varieties. The knowledge of the biology of flowering and seed-setting is necessary to obtain good breeding results. Pollen grain of angiosperm represents a highly reduced male gametophyte. It contains all genetics information. Pollen grain contains a vegetative cell and generative cell. Pollen is simple haploid organism. The pollen size variations have been attributed to environmental or nutritional conditions within a single species. Some pollen grains differences are due to meiotic abnormalities as a result of hybridization and polyploidy chromosomal deficiencies. The Pollen fertility decreases with the irradiation dose but becomes constant nearly at 40 K rad. Morphological variation was also observed after mutagenic treatment in two cultivars. These two cultivars had shown a similar response regarding germination, seedling height, pollen sterility (Kamar and Dubey, 1998).

MATERIAL AND METHOD

2.1 Sample Collection: Pollen fertility study was carried out in *Impatiens balsamina* which belong to family Balminaceae. This plant is chosen for study of pollen fertility due size of pollen grain is medium.

2.1 Fixing of flower: Acetic acid and absolute alcohol used in the ratio of the 1:3 for fixing the flower buds for at least 24-48 hours.

2.2 Permanent slide preparation:

Acetic acid, absolute alcohol and butanol were used in making permanent slides. Flower bud were opened and anther was dissected out. Anther was then placed in the center of a clean slide and squashed in drop of acetocarmine train and covered with a cover slip. The cover slip wa than held, from the corner, tightly but firmly under the thumb uing folded blotting paper and tapped gently with the blunt end of the brush, as a result of tapping the anther wall was ruptured and the pollen grain were released.

Acetocarmine stain was used to discriminate between full and empty pollen grains. Empty pollen grain consisting only of exine wall with no stain and full pollen grains containing cytoplasm, stain orange red. The sustainability of pollen grains in acetocarmine stain was used the index for determining pollen fertility and it indicate pollen viability.

From each variety of five plants were selected randomly 500 pollens were observed per plant. The mean pollen fertility for each variety of *Impatiens balsamina* was then calculated using the following formula.

Total number of fertile pollen/Total number of pollen observed* 100.

RESULT AND DISCUSSION

The pollen gains of *Impatiens balsamina* are oval-retangular in polar view and triangular in equatorial view, size range 24-42 um. Pollen generally tetra colpate, colpi short, distinct, funnel shaped, margin thin (Fig.2).

The mean pollen fertility is calculated in the five varieties e.g. purple, red, orange, pink and white of *Impatiens balsamina* (Fig. 1). It is compared in table. The percentage of stained pollen grains was observed in pink variety.

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Functional and non functional gametes are studied by pollen fertility. Pollen fertility of a plant directly correlates to the efficiency of the meiotic process. High value of pollen fertility reflects regularity in meiosis. Pollen fertility in the different variety of *Impatiens balsamina* varies from 77-95% (Fig.3). Pollen fertility affected by temperature, insecticides, irregularities, and radiations chemicals. There was a statistically significant difference between groups as determined by one way analysis

of variance of pollen fertility indicates significant difference due to variety ($F_{4, 20} = 6.99, P < 0.05$). A post hoc tests showed that orange variety differed statistically significant from each of the other varieties purple, pink, red and white but the difference between variety purple, orange, red and white were not significant and levels of pollen fertility was statistically significant lowers in other variety and lowest pollen fertility showed in pink variety (Fig. 4).

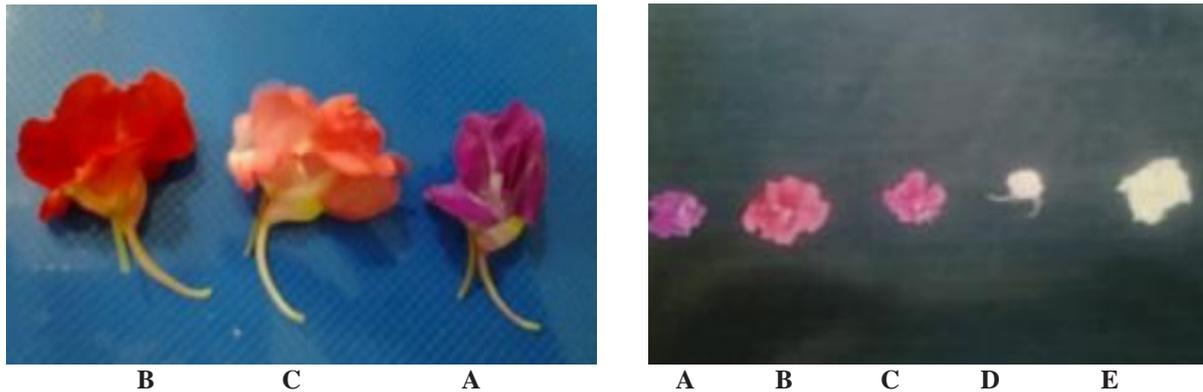


Fig.1: Flower of different varieties (A- purple, B-red, C-orange, D-pink, E-white) of *Impatiens balsamina*



Fig.2: Microscopic view of Pollen grains of *Impatiens balsamina* (F-fertile pollen, G sterile pollen)

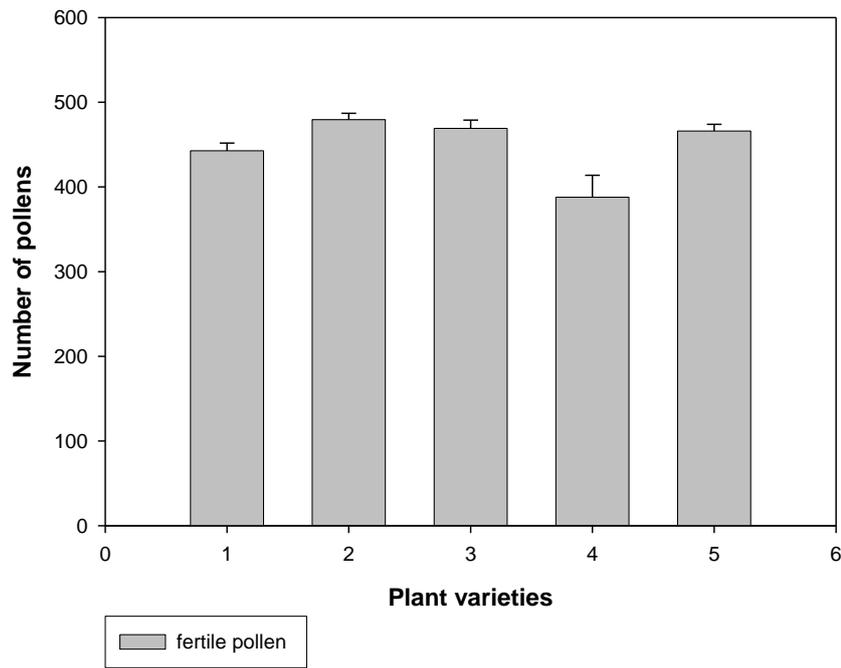


Fig. 3: Pollen fertility in five varieties (purple, orange, red, pink & white) of *Impatiens balsamin*

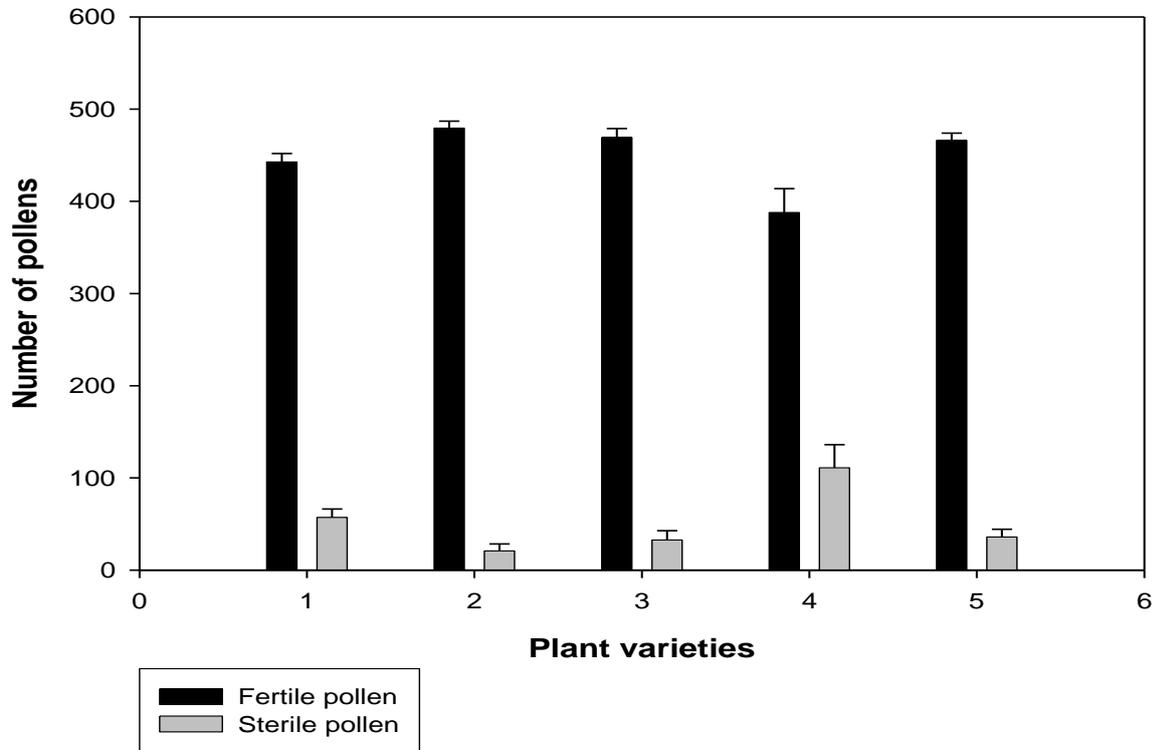


Fig. 4: Pollen fertility /pollen sterility in five varieties (purple, orange, red, pink & white) of *Impatiens balsamina*

CONCLUSION

One way analysis of variance of pollen fertility of significance is important while accepting the validity of conclusion derived from data. The goal of statistical analysis is to establish whether a difference among varieties is significant or due to sampling. The post hoc test is applied in the varieties of *Impatiens balsamina*. Orange variety is highly significant in all the varieties in term pollen fertility.

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REFERENCES

- Bose S. and Mukherjee R.** (1967). Colchipoity in *Impatiens balsamina* L. II. Studies in the C2 generation. *Cytologia*, 32: 350-353.
- Kamar, S. and Dubey, D.K.** (1998). "Induced morphological mutations in *L. sativus* L." *J. cytol Genet.* 33 (2): 131-137.
- Masuda M. Yahara T.** (1994). Reproductive ecology of a cleistogamous annual, *Impatiens nolitangere* L., occurring under different environmental condition. *Ecological research.* 9:67-75.
- Mc call C., Wller D.M., Mitchell-olds T.** (1994). Effect of serial inbreeding on fitness components in *Impatiens capensis*. *Evolution.* 48:818-827.
- Raghuvanshi S.S. and Singh D.N.** (1979). Comparative ploidy response of different varieties of *Impatiens balsamina* L. *Cytologia*, 44: 241-247.
- Schoen D.J Bell G lechowicz M.J.** (1994). The ecology and genetics of fitness in forest plants. Quantitative genetics of fitness components in *impatiens pallid* (Balsaminaceae). *Amer. J. Bot.* 81: 232-239.
- Bose S. and Mukherjee R.** (1967). Colchipoity in *Impatiens balsamina* L. II. Studies in the C2