Photoperiodic Effect on Seed Germination in Pyrethrum (*Chrysanthemum cinerariaefolium* vis.) under the Influence of Some Growth Regulators

Chetna Bisht[1*], Anoop Badoni[2], R. K. Vashishtha[1] and M. C. Nautiyal

[1]High Altitude Plant Physiology Research Center
[2]Department of Seed Science and Technology
H. N. B. Garhwal Central University, Srinagar- 246 174, Uttarakhand, India
*For Correspondence: bishtchetna@yahoo.com

ABSTRACT: In the present investigation seed germination study of *Pyrethrum* was carried out with the objective to enhance the germination percentage in respect to photoperiodic conditions as well as response of the growth regulators. For germination, seeds were kept under three different photoperiodic conditions i.e. 24 hr. continuous dark, 24 hr. continuous light and 16 hr light/8 hr dark with pre-sowing treatments of IAA-25 and 50 ppm, GA_3-25 and 50 ppm and NaClO- 10 and 20 minutes. Maximum germination (84%) was observed in 16 hr light/8 hr dark condition with IAA-25 ppm. GA_3-50 ppm also showed good germination (60%) in 16/8 hr light condition. Very poor germination was reported in control (4%) of all the light conditions, only 24 hr continuous dark condition showed 13.33% germination in control. [The Journal of American Science. 2009;5 (4):147-150] (ISSN 1545-1003).

INTRODUCTION

Pyrethrum (*Chrysanthemum cinerariaefolium*), regarded as a section of the genus *Chrysanthemum*, family *Asteraceae* is a perennial temperate plant with small white, daisy-like flowers from which natural insecticides, the pyrethrins, are derived. Traditionally, pyrethrum was produced in many African countries where hand-labour was used to plant, harvest, and dry the crop (Davis, 2001; Wandahwa *et al.*, 1996). The First attempt to introduce pyrethrum in India was made by the Forest Department, Jammu and Kashmir as early as in 1931 (Panda, 2005). Besides their ornamental importance, pyrethrum flowers have been widely used as a source material for preparation of insecticides. Being non-poisonous to man pyrethrum is particularly adapted for controlling household insects; however its use for preparing horticultural dusts and sprays, and livestock sprays is no less popular (Gnadinger, 2001). The most valuable property of Pyrethrum in comparison to other insecticides is its very low mammalian toxicity. Because of this quality, pyrethrum is the only insecticide safe for human beings, whereas synthetic insecticides pose a problem of health hazards for human beings, domestic animal and wild life (Panda, 2005).

About 200 years ago someone living in central Asia discovered that dried, crushed flowers of certain chrysanthemums were toxic to insects. During the Napoleonic Wars (1804-1815) this "insect powder" was used to control flea and body lice infestations by French soldiers. Since then, pyrethrum has been used in many forms for effective, low toxicity insect control (Jack, 2009). The increased awareness of the dangers of synthetic insecticides and the rapid building up of residence in the insect population against synthetic insecticides are acting in favour of pyrethrins, which don't show any of these disadvantages. The demand for pyrethrum flowers is therefore, rising rapidly in the word market and India has a very bright future to meet this large increase in demand as pyrethrum can be cultivated successfully in the area like Kashmir valley. Pyrethrum is used as an insecticide in the form of powder, spray, acrosol, coils, cream and ointment (Panda, 2005).

Keeping above points on view the present study is based with the objective to enhance the germinability in pyrethrum (*Chrysanthemum cinerariaefolium*) with respect to different photoperiod and growth regulators.

MATERIAL AND METHOD

For the present study seeds of pyrethrum species were washed with 5% (v/v) T-ween 20 for 15 min. and surface sterilized with 0.1% mercuric chloride (HgCl2) for 3 minutes, followed by a quick rinse in 70% ethanol, and finally 5-6 times washed with sterilized distilled water. After sterilization the seeds were subjected to the following pre-sowing treatments for 24 hr, distilled water was used as control:

T1 Control
T2 IAA-25 ppm
T3 IAA-50 ppm
T4 GA_3-25 ppm
T5 GA_3-50 ppm
T6 NaClO- 10 minute
T7 NaClO- 20 minute

For germination test seeds were sown on moist filter paper in petridishes with three replicates (25 seeds in each replicate) of each treatment and kept in seed germinator at 25 ± 1^0C temperature under three different photoperiodic conditions i.e. 24 hr. continuous dark, 24 hr. continuous light and 16 hr light/8hr dark, watering was done daily or as required. In the course of daily observations, germination was noticed when radical emerged. In the dark condition, the observations on the onset of germination were recorded by using green light.

RESULT AND DISCUSSION

Light, which influences the plant by virtue of its intensity, quality and periodicity, plays the vital role in determining the plant characteristics, distribution and survival. It is unique among the environmental factors as a driving variable and individual organism may be affected by any one of its aspect of intensity, color, duration and direction (Joshi, 2006). Variation in the temperature and light requirement for the germination of various plants has also been reported by various workers (Semwal *et al.*, 1983; Bhatt *et al.*, 1983; Nautiyal *et al.*, 1985). Several workers reported that different hormonal treatments also play an important role to overcome the problem of seed dormancy (Thapliyal and Nautiyal, 1979; Bedawi *et al.*, 1985; Kumar *et al.*, 1996; Rahman *et al.*, 1996).

Published information on photoperiodic effect with growth regulators in Pyrethrum (*Chrysanthemum cinerariaefolium* vis.) was not found so far. This is first report on Pyrethrum species about enhancement of seed germination in relation to photoperiod. In order to find out suitable condition for seed germination in Pyrethrum, seeds were subjected to different pre-sowing treatments viz. IAA, GA_3 and NaClO and different light condition. Data showed in Table-1; Fig.-1 indicates that maximum germination (84%) was observed in 16 hr light/ 8 hr dark (Plate-1-A) condition with T2 treatment (IAA-25 ppm). GA_3-50 ppm also showed good germination (60%) in 16/8 hr light condition. Very poor germination was reported in control (4%) of all the light conditions, only 24 hr continuous dark condition showed 13.33% germination in control. Maithani (2000), have also reported that light some how favored germination in *Rheum emodi* and *R. moorcroftianum* and percentage of germination reduced in dark condition. Semwal and Purohit (1980) have also reported enhanced germination percentage under light condition in various plants.

The conclusion of the present study is that the germination in pyrethrum (*Chrysanthemum cinerariaefolium* Vis.) is very poor in control and 16 hr light and 8 hr dark photoperiodic condition with IAA-25 ppm pre-sowing treatment is best to enhance the seed germination.

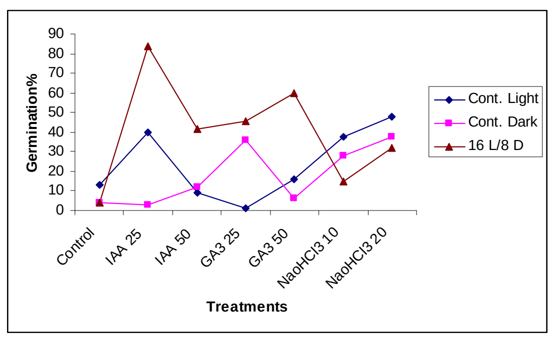

Fig. 1 Seed germination in Pyrethrum using different photoperiod with growth regulators

Plate-1-A-C: **Germination stages in different photoperiodic conditions; (A)** IAA-25 ppm in 16/8 hr, **(B)** NaClO- 20 minute in 24 hr continuous dark and **(C)** NaClO- 20 minute in 24 hr continuous light

Table-1 Photoperiodic effect on seed germination in Pyrethrum

Treatments	Germination Percentage		
	24 hr Continuous Light	24 hr Continuous Dark	16 hr Light/ 8 hr Dark
T1	4 ±0.5	13.33 ±0.3	4 ±0.5
T2	2.67 ±0.4	40 ±1.1	**84** ±1
T3	12 ±1	9 ±0.5	41.33 ±0.3
T4	36 ±1.1	1.33 ±0.3	45.33 ±0.6
T5	6 ±0.5	16 ±0.5	60 ±1.1
T6	28 ±1	37.33 ±0.6	14.67 ±0.1
T7	37.33 ±1	48 ±1.1	32 ±1

Correspondence to:
Chetna Bisht
P. I. (UCOST-Project)
High Altitude Plant Physiology Research Center
H. N. B. Garhwal Central University Srinagar- 246 174,
Uttarakhand, India
bishtchetna@yahoo.com

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