

EFFECT OF VARIOUS LEVELS OF IAA ON THE SEED GERMINATION OF SAUSSUREA COSTUS (FALC.) LIPSCHITZ (*S. LAPPÄ* (DECNE.) SCH.-BIP.)

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Seed germination of *Saussurea costus*, a perennial herb collected from the region of Tungnath (Garhwal Himalayas) 3000 m was studied under different concentrations of IAA at a constant temperature of $20\pm 1^\circ\text{C}$ in a controlled seed germinator. This was done to find out the maximum percent of germination and the growth of radicle and hypocotyl along with the survival of the seedling with an aim to multiply this species by a large-scale plantation. All the concentrations showed better germination percent except the survival of the seedling on the higher concentrations after transplanting these into the polythene bags. The various concentrations of IAA 10, 25, 50, 75 and 100 ppm were used parallel to the controlled set. Radicle and hypocotyl growth was recorded very high in the middle-lower concentrations in comparison to the higher one. The results suggest that selective application of the growth substances do have marked influence on the seed germination and the seedling growth.

Key Words: *Saussurea*, Seed, IAA, Radicle and Hypocotyle.

Saussurea costus (Asteraceae) a perennial herb with 1-2 metre height, apparently endemic and cultivated in the valley of Kashmir and neighbouring Himalayan region for its stout roots used in medicine. In Garhwal Himalayas, it is found growing at the upper limit of tree growth at the altitude of 2600-3200 m in the cool and humid climate. The seeds for propagation purposes are collected in September and flower heads harvested a little before the seed is fully ripe and stacked in the sun for a week before threshing.

Germination represents a critical event in a plant's life cycle and its timing largely predetermine the chances of survival of a seedling up to maturity (Thompson, 1973). Temperature is an important physical parameter of an environment, which determines the success or failure of a species in a particular locality, which in turn depends mostly on the germinability of the seeds of a particular species (Kumar & Gopal, 1975). It is well known that the different population of the same species vary in their temperature and light requirements for germination. Germination requirements of a particular species are a result of the interaction of its genetic make up with the environment (Wittington, 1973) and dormancy pattern of seeds of various plant species, which enable them to survive during adverse conditions (Nikolaeva, 1977). The studies on germination of alpine plants of Garhwal Himalaya (Semwal *et al.*, 1983; Wiser & Pilot, 1984) have also reported influence of various concentrations of the growth substances on seed

germination and seedling growth at a constant temperature of 25°C . The impact of various levels of the growth substances on germination has also been reported by Malasi *et al.* (1989). Due to harsh climatic conditions flowering and fruiting are seriously hampered in plants growing in high altitudes and ultimately little or no viable seeds are produced.

MATERIALS AND METHODS

Seeds of *Saussurea costus* a medicinally important plant species were collected from Tungnath (3000m) area of Garhwal Himalayas during October and November 1997. These were dried in open air for 10 days and stored in polythene bags for around 1-2 months. These were soaked for 48 hrs under different concentrations of IAA (Indole-3-acetic acid) such as 25, 50, 75 and 100 ppm levels at room temperature along with a controlled set treated with distilled water.

Seeds were sown in petridishes (8cm diameter) on one layer of Whatman No.1 filter paper for three replications containing 25 seeds each. Petridishes containing seeds were placed for germination at $20\pm 1^\circ\text{C}$ at a constant temperature in a thermostatically controlled seed germinator. Minimum ten seedlings in each petridish have been measured for the growth of radicle and hypocotyl and the observations processed by Mean, SD and SE.

RESULTS

The observations have been recorded on each

Table 1. *Saussurea costus*, effect of different levels of IAA on seed germination with elongation of radicle and hypocotyl.

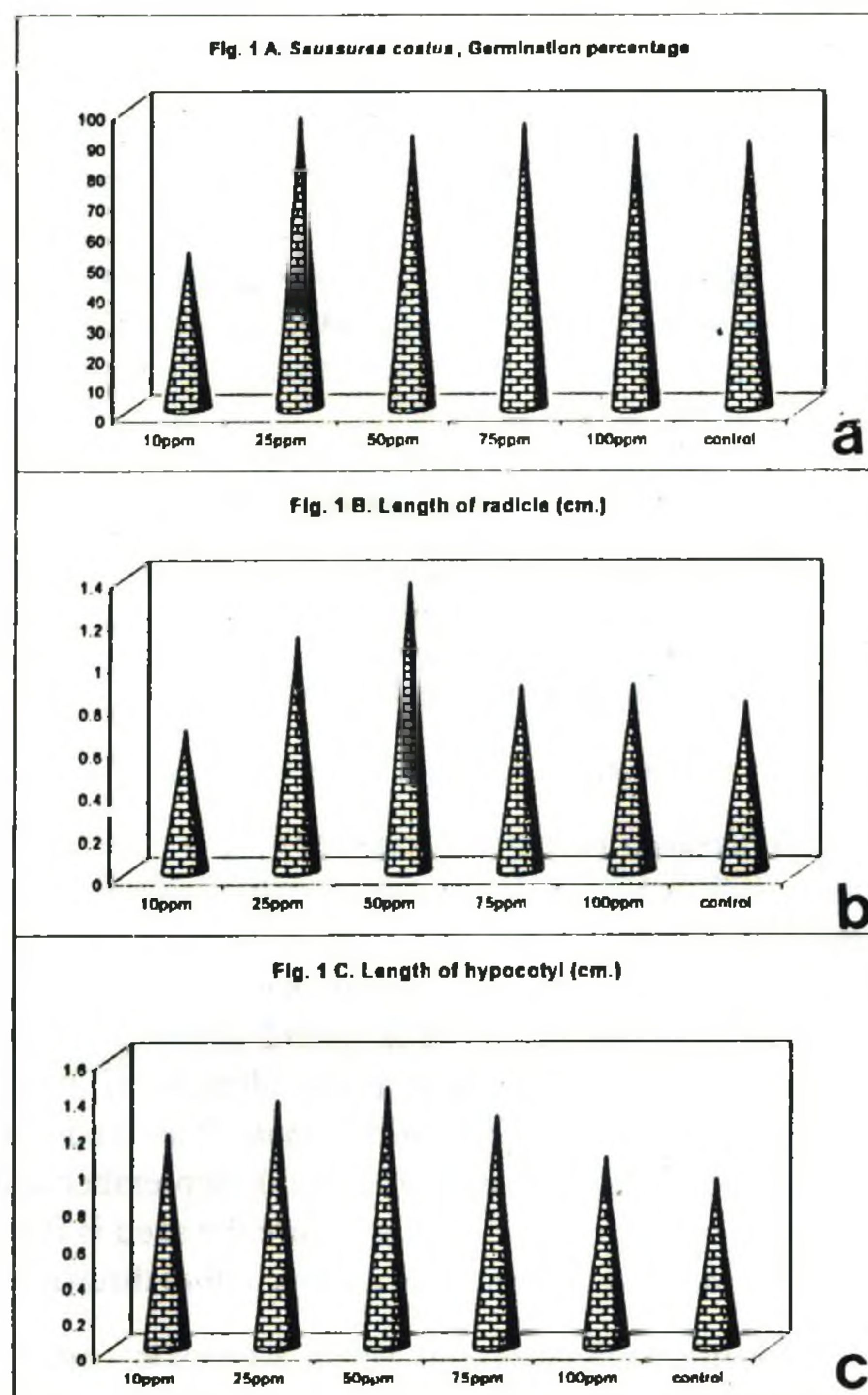
Concentra- tions	Germination percentage	Length of radicle (cm.)	Length of hypocotyl (cm.)
10 ppm	52	0.663±0.286 (0.058)	1.17±0.591 (0.121)
25 ppm	96	1.100±0.592 (0.123)	1.350±0.917 (0.205)
50 ppm	90	1.258±0.958 (0.196)	1.424±0.974 (0.213)
75 ppm	94	0.867±0.520 (0.106)	1.267±0.682 (0.149)
100 ppm	90	0.874±0.494 (0.103)	1.043±0.559 (0.122)
Control	88	0.791±0.512 (0.107)	0.925±0.547 (0.122)

alternate day and continued till no more additional seeds germinated. The data obtained for different parameters have been given in table 1 and graphical representation shown in Fig. 1A-C. The highest germination (96%) was recorded on the last day of observation under 25ppm. In the lowest levels of IAA, 10ppm showed only 52% which is the lowest in comparison to the controlled set (88%).

The length of the radicle and hypocotyl showed considerable dissimilarities in the same germination medium as well as under identical climatic conditions. The maximum influence on the hypocotyle has been recorded at 50ppm which gained by 53.94 percent in length followed by 45.94 percent (25 ppm) and 36.97 percent under 75 ppm of this hormone. The least augmentation has been witnessed under 100 ppm concentration (12.75%). Similarly, an identical trend has been noted in respect to the length of the radicle which gained by as high as 71.68 percent under 50 ppm of the growth regulator followed by 39.06 percent under 25 ppm whereas the other concentrations did not bring about any discernible alterations.

DISCUSSION

In the present study on *Saussurea costus*, application of growth substance enhances the seed germination and growth of the radicle and hypocotyl under various concentrations. IAA 10 ppm resulted in 52% and 25 ppm showed the highest (96%) followed by 75ppm (94%) germination. As observed, other higher levels did not show better germination results



Figures 1A-C, A-showing seed germination in *Saussurea costus*, B-length of radicle, C-length of hypocotyl after treatments with different concentrations of IAA

in comparison to the controlled set. The findings are in line with those of Singh *et al.* (1985) and Chauhan & Paliwal (1992).

As judged by the radicle growth, different concentrations of IAA proved more effective except 10ppm (0.66 cm) and 100 ppm (0.87cm) as compared to the controlled situation (0.79 cm). The highest growth of the radicle is recorded in 50ppm (1.35 cm) followed by 75 (0.86 cm) and 25ppm (1.10 cm). The results also find support from the findings on *Tectona grandis* and *Dendrocalamus strictus* (Mishra & Mishra, 1984).

As far as the hypocotyl is concerned IAA 50 ppm stimulated it to the highest (1.42) degree as also noted by Chakravarty (1972). A corresponding decrease in the elongation of hypocotyl in comparison to the control (0.92) was however not noted. The lowest

level of IAA (10ppm) resulted in a maximum (1.17cm) hypocotyl length while it reached up to 1.35cm in 25 ppm IAA treatment.

The increased hypocotyl and shoot growth may be due to the variable stimulation of increase in enzyme activity by different concentrations of IAA. This also suggests that IAA could penetrate the seed coats and enhance the germination process.

It is well known however, that the application of some growth regulators to seeds promotes their germination. The important aspect of this study is to find out the appropriate temperature and levels of growth substances such as IAA, which has been generally less used in the seed germination of this species of Himalayan regions. This could be of great significance and of practical use in rapid multiplication of this economically important plant species.

It is thus imperative that identical studies be conducted on other tree species also generating data base so that the use of growth regulators can be extended to produce healthy seedlings required to support large-scale plantations of those species.

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