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Effect of Leaf Extract of *Verbascum chinense* (L.) Santapau on Seed Germination and Seedling Growth of Onion (*Allium cepa* L.)

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ABSTRACT

The present investigation deals with the effect of aqueous leaf extract of *Verbascum chinense* (L.) Santapau on seed germination and seedling growth of *Allium cepa* L. The five concentrations of leaf extract viz. 5, 10, 15, 20 and 25% were used for 12 and 24hrs time duration. The overall results obtained on the parameters i.e. % seed germination, seedling growth, and vigour index indicated that, lower concentrations i.e. 5, 10 and 15% had stimulatory effect while higher concentrations i.e. 20 and 25% had inhibitory effect. Higher inhibition was due to higher concentrations (25%) at 24hr. treatments. The results obtained on Response index and % phytotoxicity indicated that lower concentrations had positive response and negative phytotoxicity while higher concentrations showed completely opposite trend. Highest positive response of test solution was at 10% concentration for 24hr. treatment. Highest % phytotoxicity was due to higher concentration (25%) for 24hr.

Key words: *Verbascum chinense* (L.) Santapau, leaf extract, onion (*Allium cepa* L.), seed germination, seedling growth.

I. INTRODUCTION

Verbascum chinense (L.) Santapau is a member of family Scrophulariaceae commonly found as a weed. It is an annual, erect, glandular-hairy herb, 20-70cm tall. Leaves are radical and cauline, radical leaves are long while cauline ones are elliptic-oblong or ovate-oblong, sessile.

Plants are well-known for presence of various chemical compounds, active principles and secondary metabolites. Plant released some phytochemicals by exudation from roots, leaching from stems and leaves or decomposition of plant material. This phenomenon may be produce beneficial or harmful effect on the growth of another plants and it can be evaluate by testing the effect on physiological mechanism which leads to stimulation or inhibition of seed germination, seedling growth etc. Hence, an attempt has been made to study the effect of leaf extract of *Verbascum chinense* (L.) Santapau on the seed germination and seedling growth of Onion (*Allium cepa* L.).

II. METHODS AND MATERIAL

Plant Material- The leaves of *Verbascum chinense* (L.) Santapau were collected from the college campus and Seeds of Onion of local variety were obtained from the farmer.

Preparation of plant extract-

Fresh leaves of *Verbascum chinense* (L.) Santapau were collected and finely grinded using mechanical grinder. The filtrate was designated as stock solution of 100% concentrations. From this stock solution the treatment solution of different concentrations i.e. 5%, 10%, 15%, 20% and 25% was prepared with the help of distilled water.

Seed Treatments-

The 12hr. pre-soaked seeds of onion (*Allium cepa* L) were treated with different concentrations (5%, 10%, 15%, 20% and 25%) of aqueous extract of *Verbascum chinense* (L.) Santapau for 12 and 24hr. 25-seeds were taken for each treatment. The treated seeds were thoroughly washed under running tap water. Untreated seeds were used as control.

Bioassay-

The treated seeds were kept in sterile petri-plates on moist germination paper. 25-seeds/petri-plate /treatment were used and data obtained was used to study effect of test solution on onion seed germination and seedling growth. The data obtained were used to calculate % seed germination, seedling growth, vigour index, response index and % phytotoxicity.

1. **% Seed germination-** After treatment seeds of Verbascum chinense (L.) Santapau, were placed in sterile petri plates on germination paper for germination.

   % Seed germination was calculated by using following formula-

$$\% \text{ Seed Germination} = \frac{\text{Number of seed germinated}}{\text{Total Number of seeds kept for germination}} \times 100$$

2. **Seedling growth** (10-DAS) -Root and shoot length were measured at the end of the 10-DAS (in cm). Randomly selected 10-seedlings were used.

3. The **Vigour index** (VI) of the seed was estimated by the following formula (Abdul-Baki and Anderson, 1970)

$$\text{Vigour index} = \frac{\text{Germination percentage} \times \text{Seedling length (mean)}}{100}$$

4. **Response Index** (RI) was calculated using the formula of Richardson and Williamson (1988) to observe the degree of stimulation or inhibition by various concentrations of extracts on seed germination, root, shoot and seedling length.

$$\text{Phytotoxicity \%} = \frac{\text{Length of control seedling - Length of treated seedling}}{\text{Length of control seedling}} \times 100$$

III. RESULTS AND DISCUSSION

The influence of secondary metabolites from the weeds on the growth and development of different plants, agricultural crops and biological systems was studied by various workers. (Kavitha et. al. 2012, Patel and Pandya 2013, Naz and Bano 2014 and Joshi and Joshi 2016).

The data recorded in Table No. 1 showed that, the percent seed germination was increased due to lower concentration (5, 10, and 15%) and it was decreased at the higher concentrations (20 and 25%) of aqueous extract of *Verbascum chinense* (L.) Santapau for both 12 and 24 hr. time duration treatments. Thus, the lower concentrations *i.e.* 5, 10 and 15% had stimulatory effects while the higher concentrations i.e. 20 and 25% were inhibitory. But, in comparison with the concentrations of test solution, as concentrations of test solution increased the % seed germination was decreased. As compare to control and lower concentrations, the drastic reduction in % seed germination (52.50%) at 25% test solution for 24 hr. treatment. Kavitha et al. (2013) concluded that, the lower concentrations (2.5 and 5%) of leaf extracts of *Vitex negundo* L. stimulated the seed germination, growth and biochemical constituents (Chlorophylls, amino acid, protein and total sugar) of black gram and green gram.

The result obtained regarding the root length, shoot length and total seedling length indicated that, lower treatments i.e. 5, 10 and 15 % were stimulatory and it was 5.74cm (5%), 8.42cm (10%) and 10.28cm (15%) for 12hrs and 10.40cm (5%), 12.36cm (10%) for 24hrs

respectively. The highest increase in root, shoot and total seedling length was observed at 15% aqueous extract of *Verbascum chinense* (L.) Santapau. Results on seedling growth indicated that, 10% at 24hr. treatment was more stimulatory than the other treatments i.e. root, shoot and total seedling length was 3.98cm, 8.38cm and 12.36 cm respectively. Rabia and Bano (2014) reported that, the extracts of *Ricinus communis* exhibited stimulation in both root and shoot length of maize in all the treatment. Roy *et. al.* (2012) also reported that, root and shoot length was significantly increased due to the aqueous extract of Bohera (*Terminalia bellirica*). Naz and Bano (2013) reported that aqueous leaf extracts of *Calotropis procera* and *Citrullus colosynthis* stimulated the root length, root fresh weight and root dry weight of maize seedlings. Due to the highest concentration i.e. 25% at 24hr. time duration, the root, shoot and total seedling was drastically reduced. It was 1.15cm (Control- 1.91cm) and 2.05cm (Control- 3.30cm.) respectively. Lalremsang *et. al.* (2017) reported in Maize that higher concentrations were inhibitory i.e. root and shoot length was decreased due to the *Mesua ferrea* and *Schima wallichi* leaf extracts. Reduction in seedling length of Field dodder (*Cuscuta campestris* Yunck.) due to high concentrations of leaf extract of Allspice was recorded by Hassannejad and Ghafarbi (2013). Akpan *et. al.* (2017) concluded that the extract of *Lycopodium clavatum* had both inhibitory and stimulatory effects on seedling growth of *Zea mays*.

The data obtained concerning about the Vigour index, Response index and % phytotoxicity recorded in Table No. 2. Due to stimulatory effect of lower concentrations, vigour index was increased at lower concentrations while it was decreased at higher concentrations. Basalingamma (2015) reported that Vigour index of green gram seedlings decreased with the increase in concentration of ginger leaf and stem extracts, where as in rhizome extract at 10% concentration showed stimulatory effect there after decreased with increase in concentration. Das (2012) also recorded that the seedling vigour of gram seeds was decreased due to the effects of extracts of *Tectona grandis*. Desai and Gaikwad (2013) noted the results on effect of *Morinda pubescens* leaf extract on wheat and concluded that vigour index were significantly enhanced.

The results obtained regarding Response index on the basis of shoot length indicated that it was +ve *i.e.* stimulatory for lower concentrations and –ve *i.e.* inhibitory for higher concentrations. Patel and Pandya (2013) recorded some results on Response index parameter. The results obtained regarding % phytotoxicity indicated that, higher concentrations i.e. 20% and 25% were phytotoxic which showed positive values. The results on phytotoxicity were reported by Anita and Gandhi (2013). They evaluated the effect of *Spinacia oleracea* L. and *Psidium guajava* L. on *Vigna radiata* L. Var. KM-2 and Vamban-2. Siyar *et. al.* (2017) indicated that higher concentrations of *Centaurea maculosa* and *Melilotus officinalis* were showed phytotoxic effects on growth of wheat. Leela (2017) also reported phytotoxic effect of *Tectona grandis* leaf extracts on growth and developmental changes of *Pennisetum glaucum* and *Eleusine coracana* (Gaertn). Ahmed *et. al.* (2017) confirmed the phytotoxicity of *Sida* leaf extract on germination, radicle and shoot growth of lettuce, tomato and carrot.

IV. CONCLUSION

Thus present investigation indicated that leaf extract of *Verbascum chinense* (L.) Santapau have strong biological activity. From the results obtained in present investigation, it may conclude that,

1. The aqueous leaf extracts significantly influence the germination and seedling growth of onion.
2. The effect was concentration dependent. The Lower concentrations i.e. 5, 10 and 15% were stimulatory. % seed germination, seedling growth, vigour index and response index was enhanced due to the lower concentrations.

3. The leaves of *Verbascum* chinense *(L.) Santapau* may contain some bioactive substance that may leads to the stimulation or inhibition in growth of onion seedlings.

4. Higher concentrations were phytotoxic or inhibitory for both 12hr and 24hr. time duration treatments.

5. To confirm the effect of aqueous leaf extract of *Verbascum chinense* (L.) Santapau on onion (*Allium cepa* L.), it needs pot experiment as well as field experiments.

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