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Influence of varying levels of Dalweed on the quantitative parameters of mulberry seedlings

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ABSTRACT

The investigation was carried out at Temperate Sericulture Research Institute (TSRI) Mirgund, SKUAST- K, in the year 2015. Dalweed is a noxious aquatic weed that pollutes all fresh water bodies. To check its vigorous growth, control measures are required. One of the control measures includes is its use as composting material. The study indicated that seed germination and seedling growth parameters of mulberry seeds were influenced by the varying amounts of Dalweed. Amongst various treatments used T_1 showed maximum germination rate and percentage (0.092 and 89.00) received 250g of powdered Dalweed. Lowest germination rate and percentage was recorded in control (T_6).Seed viability index and other seedling parameters like number of leaves per seedling, mean thickness of seedling, length of seedling, shoot weight and root parameters like length of root, number of roots per seedling, root volume and dry root weight was highest in T_1 and lowest in T_6.

Key words*: *Dalweed, Germination, Mulberry, Noxious, Root and Seedling

I.INTRODUCTION

Plants need a well-balanced nutrition for better growth and yield. Manures are the substances which provide nutrients for proper growth of plants. Manure is anything organic that has been added to the soil to increase its fertility and enhances plant growth. The application of manures to soil provides potential benefits including improving the fertility, structure, water holding capacity of soil, increasing soil organic matter thereby reducing the amount of synthetic fertilizer needed for crop production (Blay *et al.*, 2002). The use of decayed tissues of unwanted plants to provide nutrients for crops is a crude but effective way of exploiting weeds and is a simpler technique than any of the other alternatives available. Chukwuka and Omotayo (2008) reported that the use of non traditional organic resources such as weeds for improving the fertility of soil. Manure application enhances soil productivity, increases the soil organic carbon content, soil micro-organisms, improves soil crumb structure, the nutrient status of the soil and enhances crop yield. Organic manure is also very cheap and effective as a good source of nitrogen for sustainable crop production, but its availability remains an important issue due to its bulky nature, while inorganic fertilizer is no longer within the reach of poor-resource farmers due to its high cost. Lata and Dubey (2013) have reported that water hyacinth manure soil has been found to influence the performance of crop plants as a result of the increase in nutrient availability. The observations revealed positive

response with water hyacinth manure on the growth behaviour of seedlings as they were enhanced significantly compared with that of the seedlings grown in control. The growth and productivity of *Coriandrum sativum* was more pronounced with water hyacinth manure. Zahoor and Nazir (2015) suggested that concentration of total lipids, carbohydrates and total protein in Dalweed are in range of 1.3-5.87%, 10.24-19.13% and 0.94-2.41% respectively. They also suggested that Dalweed can be used as a potential source of nutrients. Singh and Sharma (2009) suggested that Dalweed (*Myrophillum spicatum* and *Serophyllum demersum*) available in plenty in the world-famous Dallake of Kashmir a rich source of N, P and K (1.0% N, 0.35% P and 1.0% K) and fast in mineralization. This locally available organic manure was used under integrated nutrient management system to improve fruit productivity, soil fertility and the powdered Dalweed can also be used for manure for seed germination.

II.MATERIAL AND METHODS

Dalweed manure were prepared in powdered form and mixed with two kilograms of garden soil. Twenty-eight seeds of mulberry (*Morus* sp.) were sown in polybags with approximately equal spacing between the seeds at uniform depth of 0.5-1 cm in each treatment. The experiment was laid in CRD (Completely randomized design) with four replications and six treatments (T1=250g, T2=200g, T3=150g, T4=100g, T5=50 g and T6=Control, without manure). The bags were watered regularly twice (morning and evening) and kept in sunlight. Observations were recorded on the following parameters

2.1 Germination percentage

Germination started after 11 days of sowing the seeds. From 11^{th} day observations were taken regularly and germinated seeds were counted daily to calculate germination percentage as per the International Seed Testing Association (ISTA) procedure (Anonymous, 1985). It was calculated as per the following formula given below:

$$\text{Germination percentage} = \frac{\text{No. of seeds germinated}}{\text{No. of seeds sown}} \times 100$$

2.2 Germination rate

It was calculated by the formula suggested by Ellis and Roberts (1980).

$R = \sum n / \sum Dn$

Where, R is the germination rate, n is the number of seeds germinated in days and D is the number of days counted from the beginning of the test.

2.3 Seed viability index

It was calculated by the formula suggested by Seghatoleslami (2010).

$$\text{Seed viability index} = \frac{\text{Germination percentage x height of seedling(cm)}}{100}$$

2.4 Height of seedlings (cm)

The height (cm) of seedling was measured by using normal scale in centimetre from base to the tip of the seedlings. Five observations were taken to calculate the average height of seedling.

2.5 No. of leaves per seedling

The leaves of seedlings were counted manually. Five observations were taken to calculate the average number of leaves.

2.6 Thickness of seedling (cm)

This was done by using Vernier Caliper. Three readings of each seedling were taken at three different places viz. bottom, middle and top portion and then average thickness per seedling was calculated. From every treatment five observations were taken to calculate the average thickness of seedling.

2.7 Shoot weight (g)

The shoot left after cutting the root portion of the seedlings was weighed one by one for five seedlings by using digital balance in each treatment to calculate the average shoot weight.

2.8 No. of roots per seedling

Seedlings were uprooted, washed thoroughly to remove the adhering soil and the roots counted manually. Five seedlings were taken in each treatment to calculate the average value of roots per seedling.

2.9 Length of longest root (cm)

The length of longest root was measured by using normal scale in centimeter from its base to the tip. Five seedlings were taken in each treatment to calculate the average root length.

2.10 Root weight (g)

The whole root was cut off from the seedling at the point of its origin and dried between the folds of a blotting paper. The weight of root portion of the seedling was finally recorded by using a digital balance. Five seedlings were taken in each treatment to calculate the average value.

2.11 Root volume (cc)

The root mass after it's drying in the blotting paper was used for root volume estimation using a graduated glass cylinder by water displacement technique. Whole root mass was dipped completely in the water present in

cylinder and the rise in water level was used to calculate root volume. Five observations were taken to calculate the average root volume.

III. STATISTICAL ANALYSIS

The data collected was compiled and analyzed statistically using a method described by Gomez and Gomez (1984). The significance of 'F' &'t' was tested at 5 per cent level of significance. Software package used for analysis was "OPstat" Whenever the F test was found significant at 5 per cent probability; critical difference values were used to compare the treatment means.

IV.RESULTS AND DISCUSSION

Germination rate was maximum in T_1 receiving 250 g of Dalweed manure and lowest rate was recorded in T_6 (Control). Similarly, Germination percentage was maximum in T_1 and lowest in control. Wani *et al*., 2017, reported among various manures used, Dalweed showed maximum germination rate and germination percentage. The manures in general improved the germination and other growth parameters which might be due to favorable soil physical environment created by the addition of organic manures (Sarma and Gogoi, 2015). The superiority of T_1 might be due to more water holding capacity because water is primary requirement for seed germination. The high amount of Dalweed manure releases more brassinosteroids which act phytohormones and are involved in lowering activity of RNAase enzyme which is necessary for seed germination. Mahesh *et al*. (2013), reported that brassinosteroids increased germination rate in radish seeds by elevating levels of nucleic acids and soluble proteins and lowering the activities of RNase enzyme. The Treatment (T_1) makes soil more fertile than other treatments by providing more organic matter. This is in accordance with Oliet *et al*. (2009), who reported that plant experiences better development in the soil rich in organic matter. Table 1 clearly shows that highest germination rate and percentage was found in T_1 compared to other treatments.

Table: 1 Influence of varying amounts of Dalweed manure on germination rate and percentage of mulberry seed.

Treatment	Germination rate	Germination percentage
T_1 @ 250g	0.092	89.00
T_2 @ 200g	0.089	87.90
T_3 @ 150g	0.088	87.80
T_4 @ 100g	0.088	86.60
T_5 @ 50g	0.061	75.79
T_6 (C)	0.030	58.00
C.D ($p \leq 0.05$)	**0.009**	**3.50**
SEm±	**0.003**	**1.16**

Fig. 1 Showing germination rate and percentage of mulberry seeds.

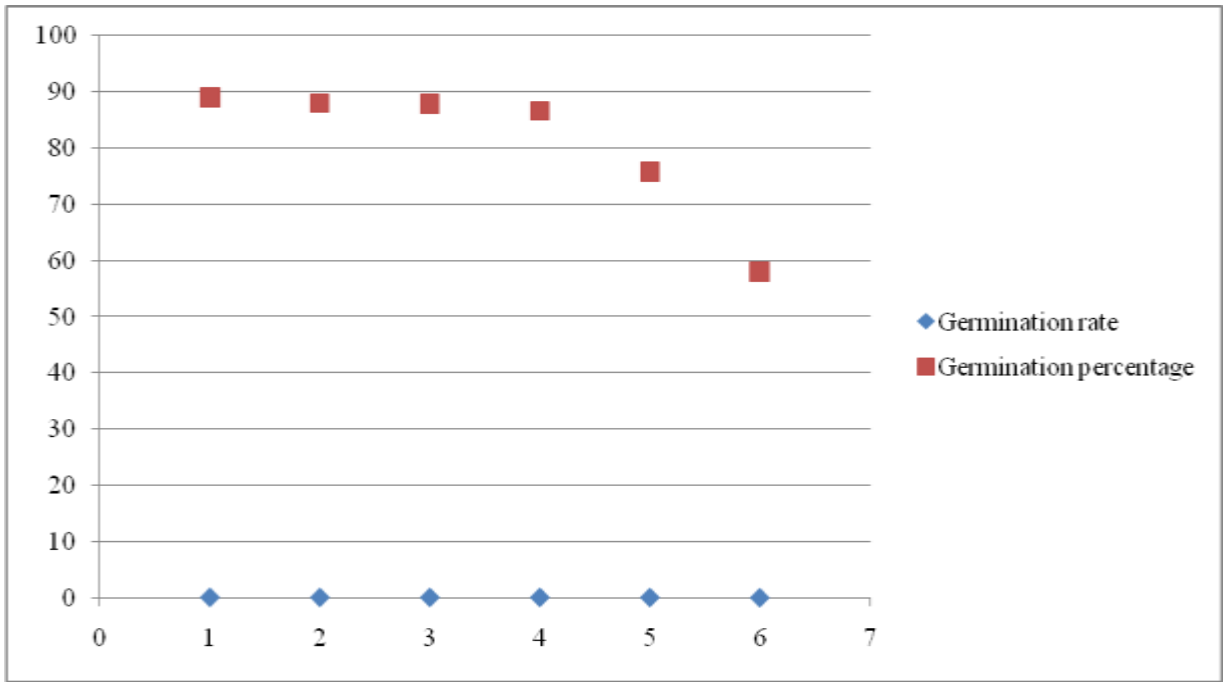


Table: 2 Influence of varying amounts of Dalweed manure on seed viability index and shoot parameters of mulberry.

Treatment	Seed viability index	Seedling length (cm)	Number of leaves per seedling	Mean thickness of seedling	Dry shoot weight
T_1 @ 250g	16.91	19.0	14.5	0.49	2.6
T_2 @ 200g	15.82	18.0	14.5	0.47	2.6
T_3 @ 150g	15.80	18.0	15.0	0.45	1.89
T_4 @ 100g	15.24	17.6	13.0	0.41	1.86
T_5 @ 50g	8.34	11.0	10.0	0.35	0.96
T_6 (C)	5.22	9.0	8.00	0.25	0.73
C.D ($p \leq 0.05$)	**1.40**	**0.24**	**0.69**	**0.03**	**0.024**
SEm±	**0.46**	**0.08**	**0.23**	**0.01**	**0.008**

Fig. 2 Showing seed viability index and shoot parameters of mulberry seedlings.

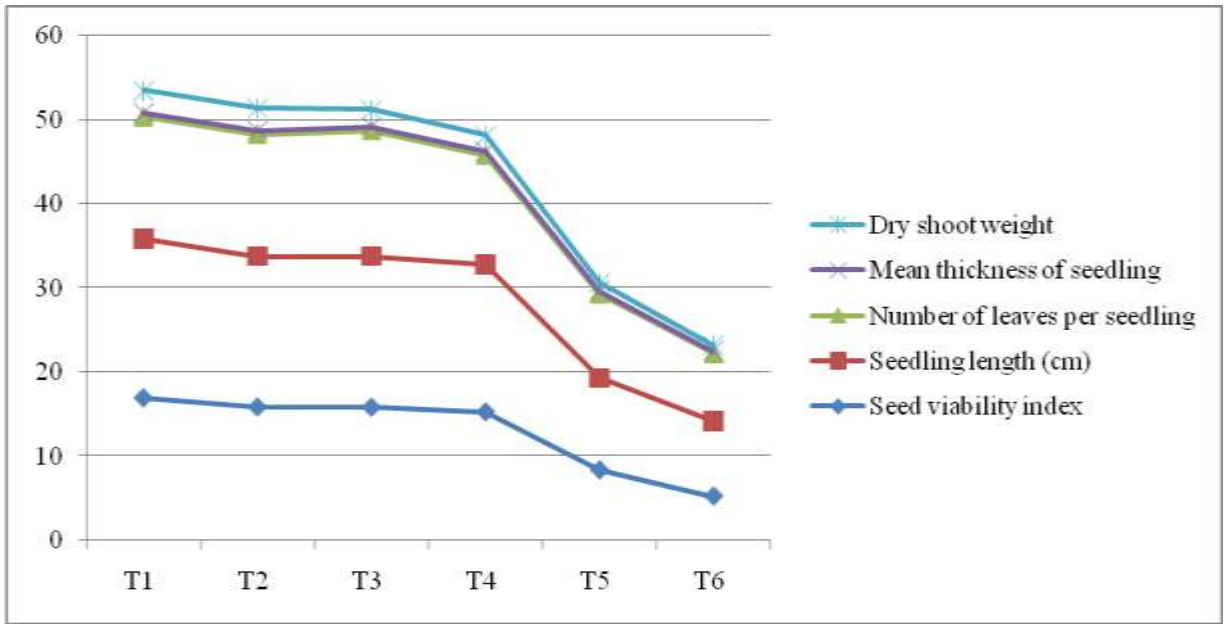
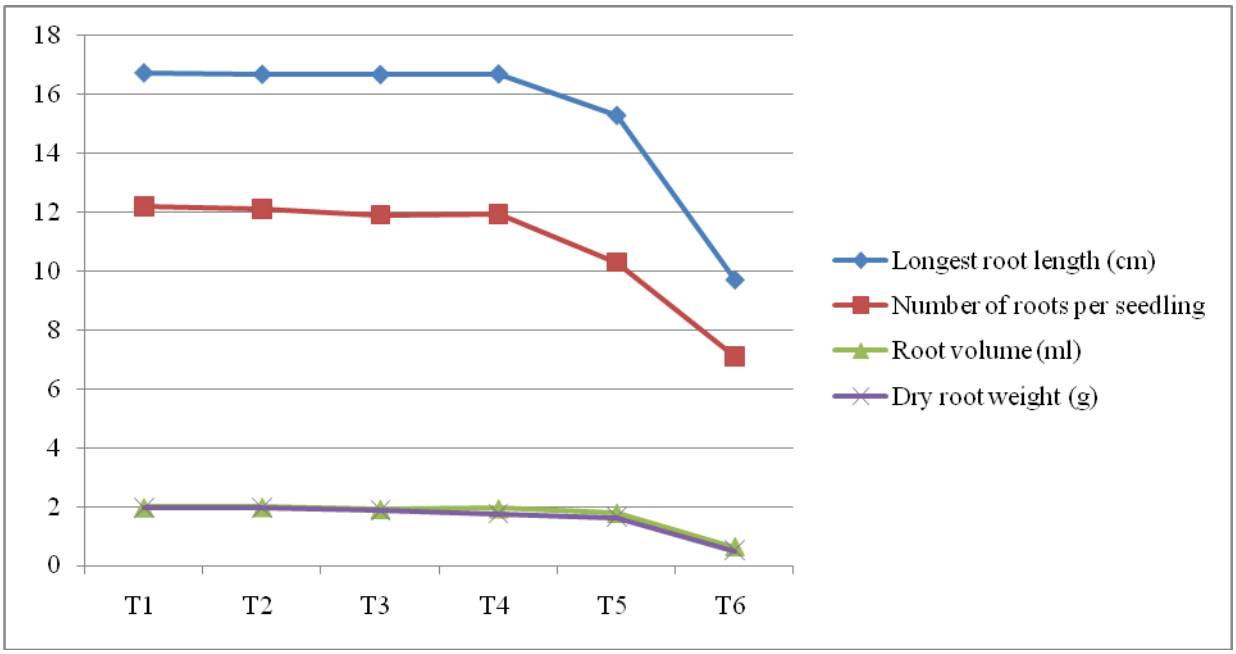


Table: 3 Influence of varying amounts of Dalweed manure on root parameters of mulberry seedlings.

Treatment	Longest root length (cm)	Number of roots per seedling	Root volume (ml)	Dry root weight (g)
T_1 @ 250g	16.75	12.2	1.98	1.95
T_2 @ 200g	16.70	12.1	1.99	1.93
T_3 @ 150g	16.69	11.91	1.92	1.86
T_4 @ 100g	16.71	11.93	1.94	1.74
T_5 @ 50g	15.30	10.30	1.79	1.63
T_6 (C)	9.70	7.10	0.63	0.50
C.D ($p \leq 0.05$)	**0.21**	**0.48**	**0.12**	**0.018**
SEm±	**0.07**	**0.16**	**0.04**	**0.006**

Fig. 3 Showing root parameters of mulberry seedlings.



Seedling height was maximum (19 cm) in T_1 which was significantly higher than rest of the treatments. It was however least in T_6 (control) recording a seedling height of 5.22 centimetres. The highest number of leaves per seedling was recorded in T_1 which was significantly higher than rest of the treatments. The least number of leaves per seedling was again recorded in T_6 (control). Mean thickness, dry shoot weight and seed viability index was highest in T_1 and least value was recorded in T_6 .The shoot parameters of mulberry seedlings were better using organic manures than those raised without any manure. The superiority of Dalweed in improving the shoot parameters of mulberry seedlings (seedling height, number of leaves per seedling, thickness of seedling, dry shoot weight) over other treatments used could be because of the reasons that high amount of Dalweed induces vigorous and fast growth in seedlings due to better water holding capacity and availability of nutrients. As a result more photosynthates are synthesized and consequently increased the shoot parameters.Mugloo *et al*. (2010), reported more availability of nutrients and moisture in Dalweed which are the basic requirements for proper establishment and faster plant growth. The root parameters was recorded highest in T_1 receiving 250g of Dalweed and their least values were recorded in control. The longest root length, number of roots, root volume and dry root weight was highest in T_1 with values 16.75, 12.2, 1.98 and 1.95 respectively. The superiority of this treatment might be due to availability of plenty of nutrients and due to addition of more organic matter which might have increased fertility as a result roots penetrate easily into the soil and hence increases root length, number of roots and dry root weight.

V.SUMMARY AND CONCLUSION

In conclusion, it seems that the application of Dalweed at highest levels promoted seedling growth and development probably via the modified nutrition, metabolism and hormonal balance. The study proved

effectiveness of highest amount of Dalweed in nurturing the mulberry seedlings as against lower ones of Dalweed. Using Dalweed which is found in abundance in the different lakes of Kashmir would reduce the dependence of Sericulturists on farmyard and poultry manure and would as such reduce pressure on these manures. Besides Dalweed is easily available manure and hence if its use is popularized it will not only make mulberry cultivation profitable but will also address the problem of cleaning of the water bodies and disposal of the weeds in an effective and proper way.

VI.CONFLICT OF INTEREST

There is no conflict of interest among the authors.

VII.ACKNOWLEDGEMENT

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