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Vikhe AM
Padmashri Vikhe Patil College
of Arts, Science and Commerce,
Pravaranagar, Ahilyanagar,
Maharashtra, India

Gholap AB
Padmashri Vikhe Patil College
of Arts, Science and Commerce,
Pravaranagar, Ahilyanagar,
Maharashtra, India

Gaikar RB
Padmashri Vikhe Patil College
of Arts, Science and Commerce,
Pravaranagar, Ahilyanagar,
Maharashtra, India

Impact of synthetic fungicide dithane M-45 and biofungicide *Withania somnifera* dunal on seed germination, seedling development and seedling vigour index in tomato

Vikhe AM, Gholap AB and Gaikar RB

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Abstract

Impact of given synthetic fungicide Dithane M-45 and biofungicide *Withania somnifera* Dunal at 5%, 10%, 15%, and 20% concentrations on seed germination, seedling development, and seedling vigour index in tomato variety NS-2535. In this vigour index, root and shoot growth, and seed germination were all unaffected by the synthetic fungicide Dithane M-45. Higher fungicide application concentrations may be harmful to seed germination and seedling growth. The vigour index, root and shoot growth, and germination% were all unaffected by the leaf extract of *Withania somnifera* Dunal. In fact, even at higher concentrations, the tested extract showed a greater boosting impact; as a result, the extracts could be used safely in place of fungicide to promote seed germination and seedling development.

Keywords: Dithane M-45, impact, bio fungicide, promote germination, vigour index

Introduction

Tomato (*Lycopersicon esculentum* Mill.) is part of Solanaceae group and it more profitable and extensively cultivated fruit vegetable crop at globally. Tomato is second to potato in global cultivation area among vegetables, but it holds the top position among processed crops (Indian Horticulture Database, 2011). The primary countries for tomato cultivation are India, the Turkey, Egypt, USA, China, and Italy. The overall place dedicated to tomatoes is 4,582,438 thousand ha, yielding a production of 150,513,813 thous. tons and a productivity rate of 32.8 tons per hectare. Maharashtra, Bihar, Orissa, Uttar Pradesh, and Karnataka are key states for tomato cultivation in India. India holds the 2nd position in tomato production, generating 16826.0 thousand tons annually from 865.0 thousand ha, achieving a productivity rate of 19.5 tons/ha. In Maharashtra, the annual tomato yield was 738.0 thousand tons from an area of 52.0 thousand ha (Indian Horticulture Database, 2011). Global biological screening of plant extracts is conducted to assess their antifungal properties. Chemicals synthesized for managing plant diseases not only contaminate the environment but also risks to human health. Allopathic effect of aqueous leaf extracts of *Withania somnifera* dual. Showed good impact on germination and seedling growth of wheat (MP Mandal *et al.* 2018) [4]. *Withania somnifera* as bio stimulant for crop plants (Sarika Sharma *et al.* 2025) [6]. Tomato is cultivated in Rahata tahasil of Ahilyanagar district during both Kharif and Rabi seasons. Our farmers frequently utilize the most prevalent technique for managing these pathogens, which involves spraying fungicides like Dithane M-45. The current study aims to examine the impact of various concentrations of biofungicide and fungicide like Dithane M-45 on seed germination and its other parameters like seedling growth, and seedling vigour index.

Materials and Methods

Seed germination was performed using the paper towel technique (Sahu and Agrawal, 2003) [5]. Seedling Vigour Index (SVI) was assessed based on seed germination along with the lengths of shoots and roots of seedlings (Mogle and Maske, 2012). The calculation was performed using the formula $SVI = (\text{mean root length} + \text{mean shoot length}) \times \% \text{ seed}$

Corresponding Author:
Vikhe AM
Padmashri Vikhe Patil College
of Arts, Science and Commerce,
Pravaranagar, Ahilyanagar,
Maharashtra, India

germination, where SVI represents the Seedling Vigour Index (Thippeswamy and Lokesh, 1997) [7]. Healthy seeds of tomato variety NS-2535 were soaked for 24 hours in various concentrations (5%, 10%, 15%, and 25%) of synthetic fungicide (M-45) and then placed on moist germination paper to evaluate seed germination and SVI analysis using the rolled towel paper method according to ISTA, (1976). The seeds were organized on damp kraft paper towels in 10 rows, containing 10 seeds per row, with an approximate spacing of 3 cm at the lower, left, and right edges. The paper towel was rolled from the right side, covered with polythene, and secured with a rubber band, then positioned vertically in a seed germinator with the open end facing

upwards at a temperature of 20°C to 30°C. At least four hundred seeds were utilized across four replicates, with 100 seeds per replicate. A group of 400 seeds acted as a control. Seed germination was noted on the 5th and 7th days. After 14 days, the percentage of seed germination and initial seedling growth parameters such as root length and shoot length were noted. The results of the germination test were calculated as averages from 4 x 100 seed replicates and presented as a percentage of the normal seedlings. The measurements of root and shoot length were taken using a scale. The percentage of germination was determined using the formula provided by ISTA (1976).

$$\text{Seed germination percentage} = \frac{\text{Number of germinated seeds}}{\text{Total no. of Seeds}} \times 100$$

Results and Discussion

The biofungicide *Withania somnifera* Dunal. Had no adverse impact on germination percentage, root and shoot development, and the V. index. The lowest germination percentage (80%) occurred in seeds that received 5% concentration of leaf extract, whereas the highest (87%) was seen in seeds treated with 15% leaf extract concentration. The overall seedling length and vigour index consistently rows with the rise in concentration, remaining above the control at each level. The extract has positively influenced the growth factors.

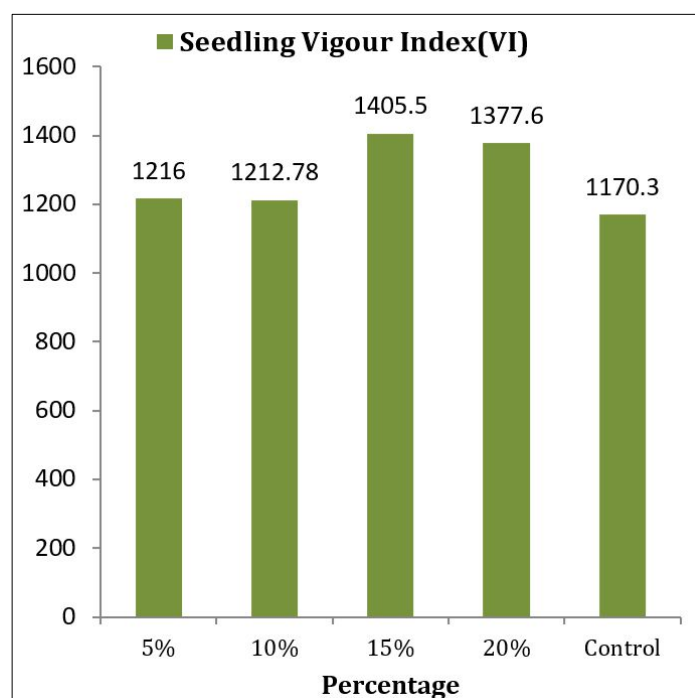
In contrast to control, these parameters suggest that specific bio-compounds in the leaves act as growth stimulants. Like

synthetic fungicide, these plant extracts showed no negative effects on seed germination and seedling growth, even at high concentrations; therefore, the extracts can be safely used as an alternative to fungicides to promote seed germination and seedling growth.

The results show that the fungicide Dithane M-45 did not affect the seed germination, root and shoot growth, or vigour index of Tomato var. Ns-2535. However, at the lowest concentration of 5% conc. The overall seedling length and vigor index were elevated and diminished at the highest concentration of 20%. As a result, higher amounts of fungicide use might negatively impact seed germination and the growth of seedlings.

Table 1: Impact of *W. somnifera* bio fungicide on seed germination and seedling development in Tomato

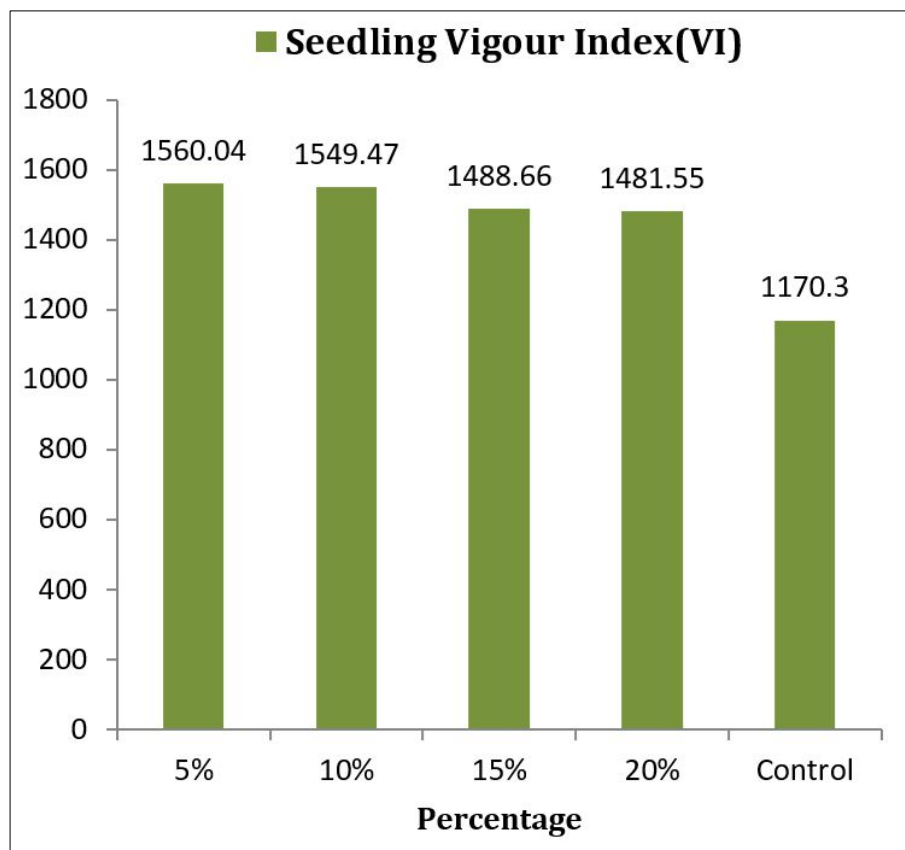
Sr. No.	Leaf extract conc.	Percent germination	Mean root length (cm)	Mean shoot length(cm)	Total length of seedling (cm)	Seedling VI
1	5%	80%	7.57	7.63	15.20	1216.00
2	10%	82%	7.68	7.11	14.79	1212.78
3	15%	87%	8.79	7.36	16.15	1405.50
4	20%	84%	9.35	7.05	16.40	1377.60
5	Control	83%	7.55	6.55	14.10	1170.3



Graph 1: Impact of *W. somnifera* biofungicide on seedling Vigour Index (VI) in Tomato

Table 2: Impact of Fungicide Dithane M-45 on seed germination and seedling development in Tomato

Sr. No.	Dithane M-45 conc.	Percent germination	Mean root length (cm)	Mean shoot length(cm)	Total length of seedling (cm)	Seedling VI
1	5%	86%	9.74	8.40	18.14	1560.04
2	10%	87%	9.86	7.95	17.81	1549.47
3	15%	86%	9.39	7.92	17.31	1488.66
4	20%	85%	8.81	8.62	17.43	1481.55
5	Control	83%	7.55	6.55	14.10	1170.3

**Graph 2:** Impact of Fungicide (M-45) on seedling Vigour Index (VI)

References

1. Indian Horticulture Database. Annual report on tomato. New Delhi: APEDA; 2011. Available from: http://agriexchange.apeda.gov.in/Market%20Profile/MOA/Product/Annual_report_Tomato.pdf
2. International Seed Testing Association (ISTA). International rules for seed testing. Seed Sci Technol. 1976;4:3-49.
3. Mogle UP, Maske SR. Efficacy of bioagents and fungicides on seed mycoflora, germination, and vigour index of cowpea. Sci Res Reporter. 2012;2(3):321-326.
4. Mandal MP, Kumari M, Mandal SS, Mandal SK, Sinha NK. Allelopathic effect of aqueous leaf extracts of *Withania somnifera* on germination and seedling growth of wheat. J Pharmacogn Phytochem. 2018;SP1:3158-3161.
5. Sahu RK, Agarwal VK. Effect of fungicidal seed treatment on seed-borne fungi, germination, and seedling vigour of rusty shield bearer (*Peltophorum pterocarpum*). J Mycol Plant Pathol. 2003;55(1):84-88.
6. Sharma S, Shukla A, Dev K, Singh S. Screening *Withania somnifera* as a biostimulant for crop plants and chemical profiling of its active fractions. Fitoterapia. 2025;18:1-10.
7. Thippeswamy T, Lokesh S. Effect of leaf extracts on seed mycoflora, germination, and seedling vigour of sunflower. Int J Trop Plant Dis. 1997;15:53-58.