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EFFECT OF BAVISTIN ON SEED GERMINATION, MORPHOLOGICAL FEATURES AND YIELD OF *Vigna radiata*

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ABSTRACT

The experiment was conducted at D.S. College Aligarh during the period of July, 2011 to October, 2012 to evaluate the effect of bavistin in M_1 and M_2 generation on *Vigna radiata* variety PM-5. The seeds were treated with the concentration of 0.25%, 0.50%, 0.75%, and 1% of bavistin before sowing in the experimental plots in M_1 generation. The seeds obtained from M_1 generation were again treated with the corresponding concentration of bavistin before sowing in the experimental plots. The results showed increasing trends in the germination percentage, number of branches per plant, and number of pods per plant up to 0.50% concentration in treated seeds. The increasing trend in the height of the plants and weight of the seeds were observed up to 0.75% concentration treated seeds. But when the concentration increases thereafter, results showed decreasing trends in the germination percentage, height of the plants, number of branches per plant, number of pods per plant and weight of the seeds in both M_1 and M_2 generation. Therefore the effect of bavistin on overall growth of the plants and yield is positive up to 0.50 % treated seeds. Treatment concentration higher than 0.50% concentration began deleterious effect on germination, number of pods per plant and number of branches as well as treatment concentration more than 0.75 % concentration had deleterious effect on height of the plants and weight of the seeds in M_1 and M_2 generation. Thus overall impact of bavistin on yield is positive up to 0.50% concentration treated seeds. With increasing the treatment concentration of bavistin more than 0.50% concentration, the yield showed decreasing trends.

KEYWORDS : *Vigna radiata*, Bavistin, Morphology, Yield

Pulses have been cultivated by human since ancient times. They have become very important in our daily diet. At least one of these pulses chana (Chickpea), mung, masur, tur, urad is found in the menu of most of the Indian families every day. According to (Kushwah et al. 2002) pulses can help to improve protein intake of meals in which cereal and root tubers in combination with pulses are eaten.

Mung bean is one of the many species recently moved from the genus *Phaseolus* to *Vigna*. Several mung varieties along with traditional varieties are available for cultivation. We have selected PM-5 for our experiment. It is a short duration crop.

Mung bean plants are susceptible to many pathogens. (Tanweer, 1982) reported that fungicides treated seed improves seed health, plant stand and crop yield together with the control on seed borne diseases. To increase the yield of plants, agrochemicals are used by the farmers. But it is observed through many studies that it's use can also cause many serious problems for human beings, environment, water bodies, plants and soil quality too.

Some workers reported that problems such as health hazards, undesirable side effects and environmental pollution caused by the continuous use of synthetic chemical pesticides. Heavy pesticide use in food crops especially rice has triggered wide spread farmer health problems in Asia (Antle and Pingali,1994). (Bazzi et al.,2009) concluded by their experiment on green beans that there is a need for careful control of the spraying doses of dithiocarbamate fungicide.

Great differences between activities of the enzymes and ATP contents caused by the fungicides were observed, especially when the rates used were higher than the field rate. The fungicide application decreased wax content and modified its morphology, causing ruptures and missing crystalloids that can make the plant more susceptible to diseases, herbivory and desiccation (Lichston et al., 2006). Indiscriminate use of agrochemicals on farms can affect soil flora and subsequently food production (Ampofo et al., 2009).

The effects of herbicide vapours on non-target plants and phytotoxic effects of ethofumesate and chlorpropham on wild plant species naturally growing in ditches, hedges and field boundaries.

Procymidone, fludioxonil, and pyrimethanil are widely used to control the pathogenic fungus Botrytis cinerea in Champagne's vineyards. These fungicides may end up in surface waters and present potential risks for

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aquatic vascular plants and algae(Verdisson et al., 2001).

It is reported that benomyl has some negative effects on mitotic divisions in onion root tip cells (Dane and Dalgic, 2005). Nodule development was inhibited at increased levels of bentazone, chlorsulfuron, glyphosate and mancozeb (Martensson, 1992).

Poornima Sharma, 2011 observed deleterious effect of carbendazim on non-target micro-organism, however it is found that chemicals shows quick disease control over biocontrol agents.

Several workers have reported the effect of bavistin on different plants considering particular activities but it's overall impact on the germination, morphological features and yield in field condition. The purpose of the present study is to evaluate the impact of bavistin on seed germination, plant height, number of branches, time taken for initiation of flowering, number of pods per plants, period of harvesting & weight of seeds of *Vigna radiata* in M_1 & M_2 generations.

MATERIALS AND METHODS

Seeds of *Vigna radiata* (2n = 22) were procured from GBPU Agriculture & Technology, Pantnagar. Healthy seeds of equal size & shape were selected for treatment with bavistin. Molecular weight of bavistin [$C_9H_9N_3O_2$] is 191.2. Before sowing in the field, the seeds were first soaked in water for 4 hours and thereafter 100 seeds were placed in separate petridishes containing concentration of 0.25%, 0.50%, 0.75% & 01% of bavistin for two hours in the laboratory and then the treated seeds were sown in the experimental plots (field) under protect in lines keeping distance of 15 cm between the plants and 30 cm between the lines.

The emergence of hypocotyls and cotyledons above the surface of the soil was taken as an index of germination. Arrangement were made for regular weeding and irrigation. Neither any chemical nor fertilizer were used. The seeds were sown in the field before mid of the July and harvesting was done within a period of mid September to second week of October. The morphological characters were studied with respect to plant height, number of 100 seeds were recorded. This is considered as M_1 generation.

Mature seeds of M_1 generation from the plants treated with different concentration were harvested and stored separately to have four sets. This sets were used next year in the same way after giving the treatment of different concentration of bavistin and the resulted crops was considered as M_2 generation. The seeds of each sets was treated with the corresponding concentration of bavistin. Morphological characters were recorded in M_1 & M_2 generations and finally the phenotypic variability and seed yield were calculated.

RESULTS AND DISCUSSION

The results obtained in the present study have been shown in Table, 1 and 2 and Figure, 1. (A-E) and expressed together with the discussion in separate heading as under:

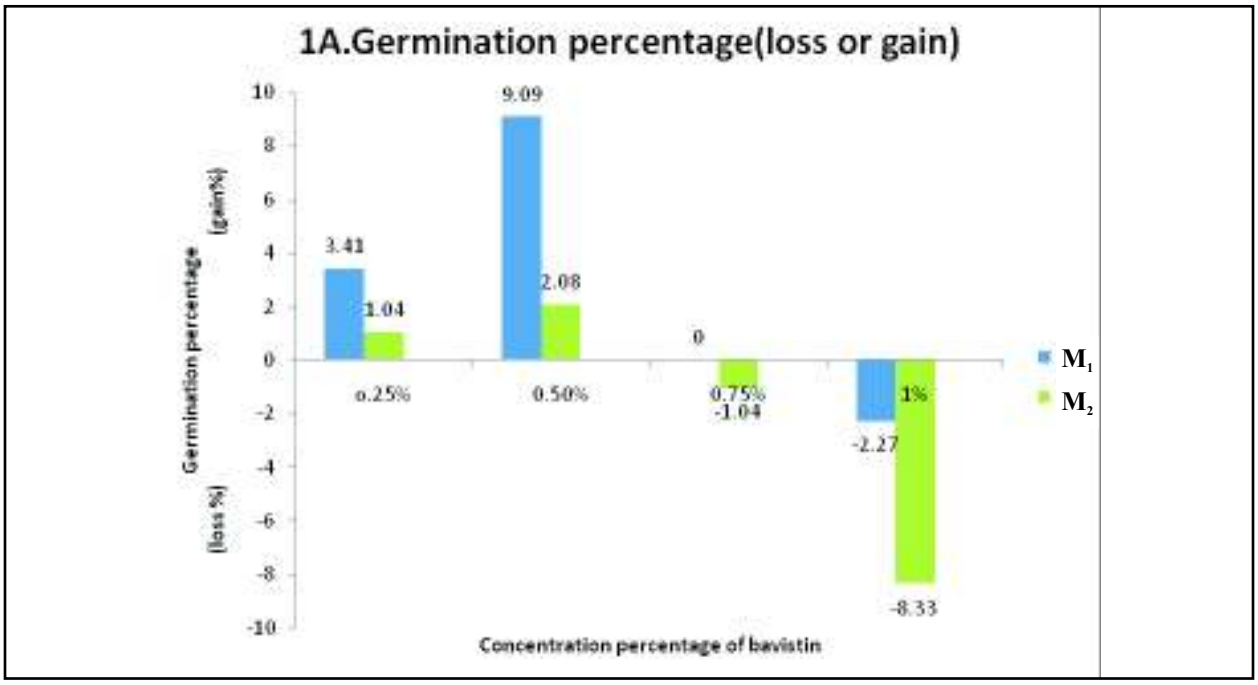
Effect on Seed Germination

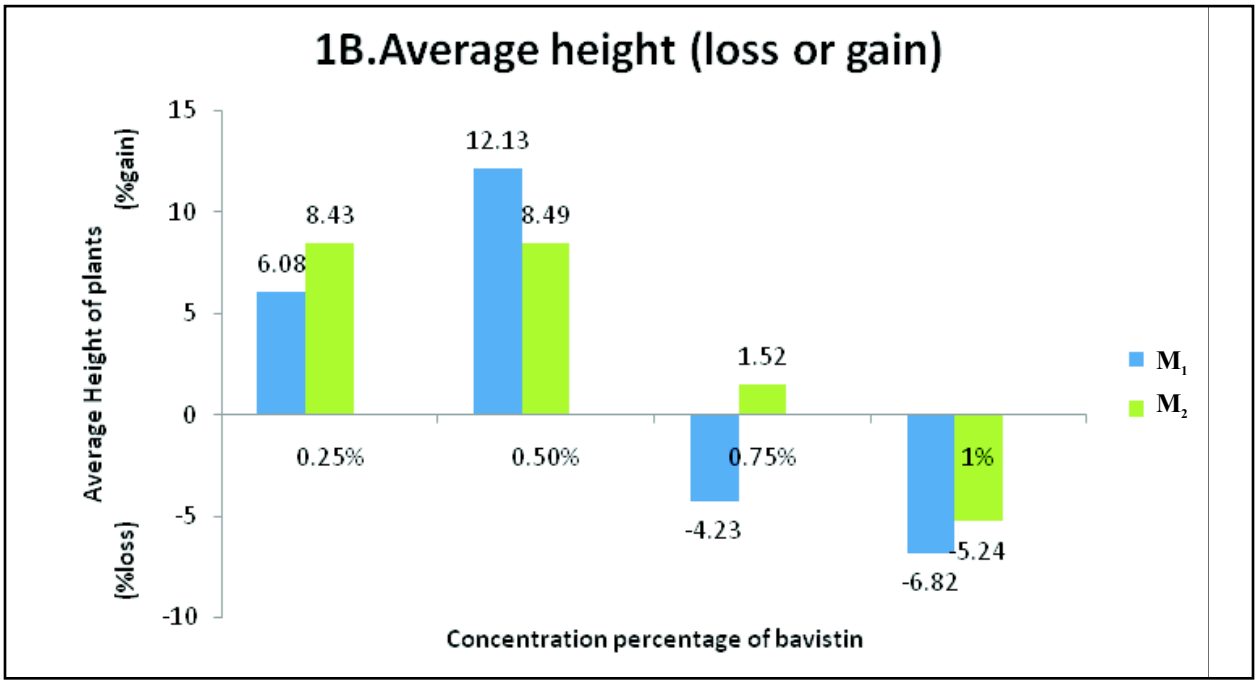
The germination percentage was 91%, 96%, 88% & 86% in M_1 generation whereas it was 97%, 98%, 95% & 88% in M_2 generation under the treatment of 0.25%, 0.50%, 0.75% and 01% concentration of bavistin respectively. The germination percentage was 88% and 96% in M_1 and M_2 generation respectively under control. Thus increase in germination percentage was recorded in case of seeds

Table 1: Effect of Bavistin on Germination, Morphology and Yield of *Vigna radiata* in M_1 Generation

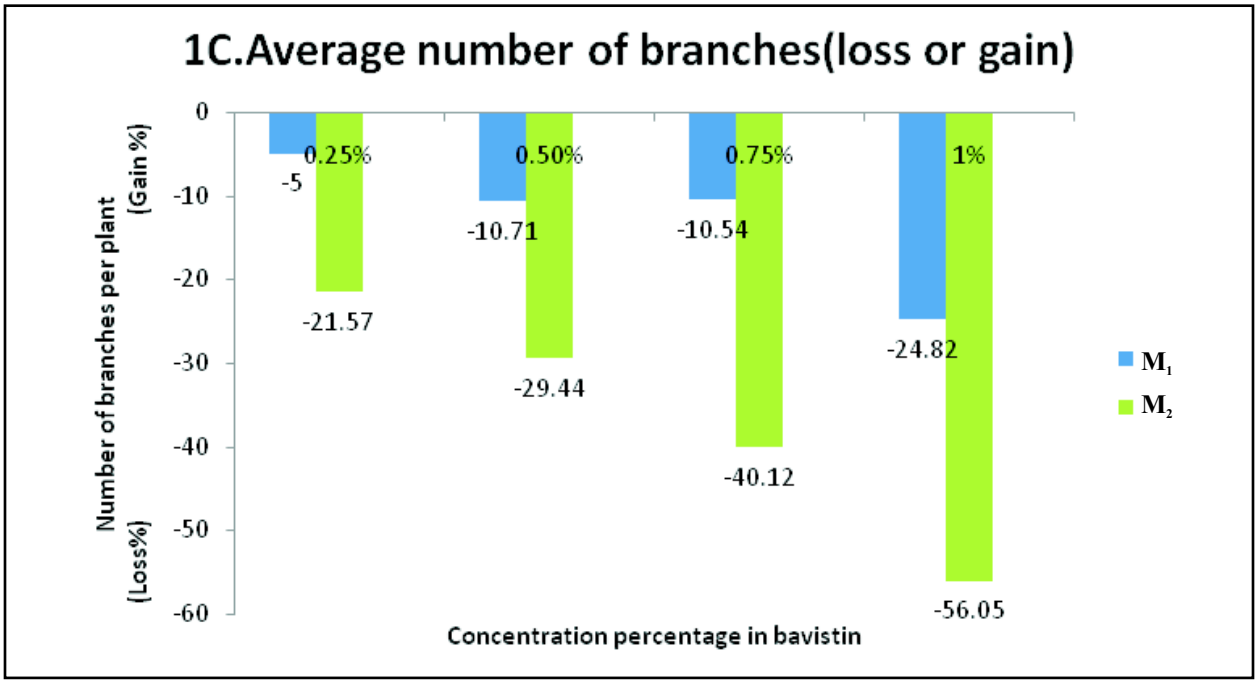
Treatment (Bavistin)	Seed Germination	Plant Height (in cm) +SD	No. of Branches / Plant +SD	Days Taken for 1st flowering	No. of Pods /Plant +SD	Harvesting Period	Wt. of 100 Seeds(in gm) +SD
Control	88%	61.00±18.37	5.6±1.48	32-34	17.40 ± 6.06	54-90	3.729 ±0.100
0.25%	91%	64.71±12.25	5.32±1.60	30-32	17.60 ± 2.79	54-90	4.128 ± 0.238
0.50%	96%	68.40±06.78	5.00±1.09	30-32	17.31 ± 3.03	54-90	4.133 ± 0.218
0.75%	88%	58.42±11.50	5.01±1.26	29-32	15.74 ± 5.75	54-90	3.950 ± 0.163
1.00%	86%	56.84±09.74	4.21± 0.77	30-32	14.32 ±4.46	54-90	3.194±0.105

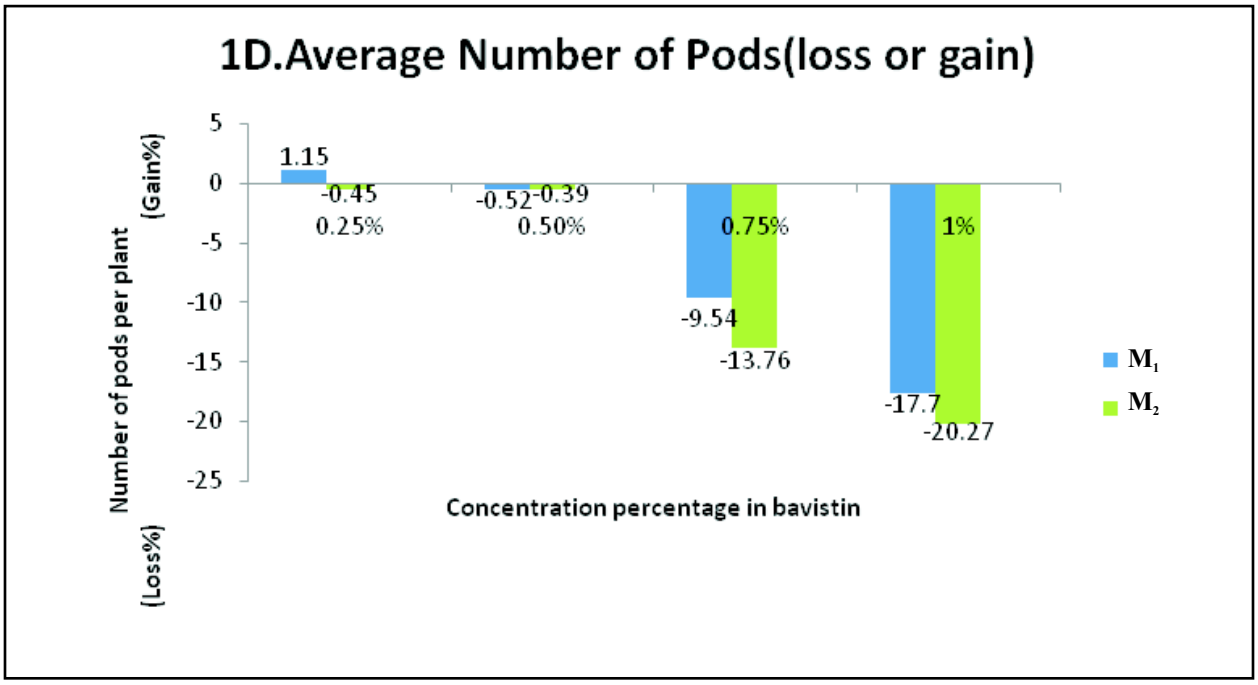
Figure 1(A-E): Percentage Loss or Gain in Respect to Control in M_1 and M_2 Generation in Bavistin Treated Seeds





treated with 0.25% & 0.50% concentration of bavistin in both the generations. Decline in percentage germination was recorded in 0.75% & 01% concentration of bavistin treated seeds in both generation. The maximum decline of 8.33% in comparison to control was recorded in 01% treated seeds in M_2 generation. At the same time, maximum increase of 9.09% was recorded in 0.5% concentration of bavistin treated seeds in M_1 generation (Figure,1A). This increase in germination percentage might be due to the

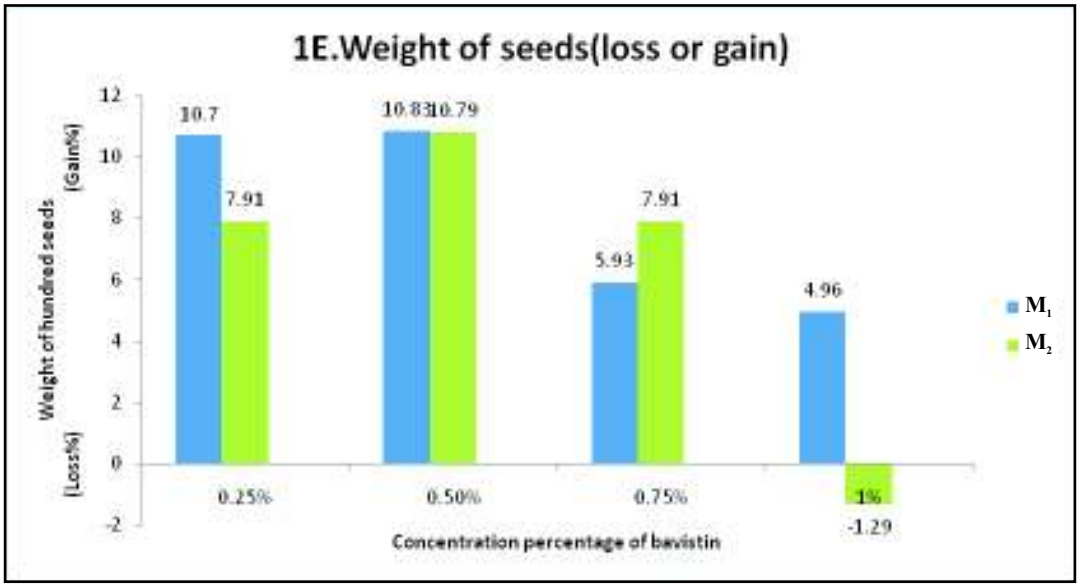




decrease of seed mycoflora (Kale et al., 1992).

Effect on Height of The Plant

The average height of fully developed plants was found to be 61 cm & 47.34 cm in M_1 & M_2 generation respectively in control. The seeds treated with 0.25%, 0.50%,0.75% & 01% concentration of bavistin showed an average height of 64.7 cm, 68.40 cm58.42 cm & 56.84 cm in M_1 generation and 51.33 cm, 51.36 cm, 48.06 cm & 44.86 cm in M_2 generation. Thus there is an increase in the average height with increasing the treatment concentration of



bavistin up to 0.50% in M_1 generation & up to 0.75% treatment concentration in M_2 generation. The maximum increase in height was observed in 0.50% & 0.75% treatment concentration in M_1 & M_2 generation respectively. Thereafter, the average height began to show decreasing trends with increasing the treatment concentration with respect to control (Figure,1B).

Effect on Number of Branches

The average number of branches per plant decreased with the increase in the concentration of bavistin in both M_1 & M_2 generation. The number of branches showed maximum loss of 56.05% in M_2 generation while it was 24.82% in M_1 generation under the stress of same concentration i.e. 01% of bavistin. This variation clearly indicate that increase in the treatment concentration of bavistin reduced the number of branches but the losses incurred were inclined in M_2 generation as compared to control (Figure ,1C).

Days Taken For Flowering

There is not a significant difference in days taken for flowering it is almost same for plants treated with different concentration in both M_1 and M_2 generation.

Days Taken For Harvesting

There is no significant difference between the days taken for harvesting in both M_1 and M_2 generation in comparison of control.

Number of Pods Per Plant

The average number of pods per plant was 17.40 & 17.81 in M_1 & M_2 generations respectively in control while it was 17.60, 17.31,15.74 & 14.32 in M_1 generation and 17.73, 17.74, 15.36 and 14.20 in M_2 generation under the treatment of 0.25%, 0.50%, 0.75% and 01% concentration of bavistin respectively. Thus there is no significant variation in the average number of pods up to 0.50% treatment concentration of bavistin. But the loss was found to be 9.54% & 17.7% in M_1 generation and 13.76% & 20.27% in M_2 generation in the plant treated with 0.75% & 01% concentration of bavistin respectively (Figure, 1D).Thus the average number of pods per plant decreased with the increased concentration of bavistin above 0.50% in both the generations.

Weight of Hundred Seeds

The weight of 100 seeds was 3.729gm & 3.187gm in M_1 & M_2 generations respectively in the control while it was 4.128gm, 4.133gm 3.950gm & 3.194gm in M_1 generation and 3.439, 3.531, 3.439 & 3.146 in M_2 generation under the treatment of 0.25%, 0.50%, 0.75% & 01% concentration of bavistin respectively. It is evident from the obtained data that the weight of 100 seeds increases in both the generations with increasing concentration of

Table 2 : Effect of Bavistin on Germination, Morphology and Yield of *Vigna radiata* in M_2 generation

Treatment (Bavistin)	Seed germination	Plant height (in cm) +SD	No. of branches/ plant +SD	Days taken for1st flowering	No. of pods/ plant +SD	Harvesting Period	Wt. of 100 seeds(in gm)+SD
Control	96%	47.34±10.76	4.96±0.89	33-35	17.81±08.76	67-100	3.187±0.161
0.25%	97%	51.33±02.71	3.89±0.97	32-34	17.73±11.83	67-100	3.439±0.160
0.50%	98%	51.36±14.11	3.50±1.16	32-34	17.74±13.38	67-100	3.531±0.021
0.75%	95%	48.06±12.03	2.97±0.74	32-34	15.36±14.04	67-100	3.439±0.108
1.00%	88%	44.86±14.38	2.18±0.88	33-35	14.20±09.62	67-99	3.146±0.181

bavistin up to 0.75%. But the highest increase was observed in the 0.50% treatment concentration. Thereafter the increasing percentage began to decline and the loss was found in 01% treatment concentration in M_1 & M_2 generation both (Figure, 1E).

On the basis of the data recorded in the present investigation, it may be inferred that the treatment of the seeds of Vigna radiata with bavistin is safe only up to 0.50% treatment concentration in spite of it's adverse effect on number of branching & pods. Above 0.50% treatment concentration adversely affect the growth and yield of the plants in both M_1 & M_2 generations. It is apparent that a single dose treatment of seeds with bavistin affects the germination, morphology & yield of plants and thus it is safely concluded that bavistin should not be used even to control the fungus infection in plants above 0.50% for seed treatment. Above 0.50% concentration is very harmful to *Vigna radiata*. It adversely affect the development and yield.

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