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TO STUDY THE EFFECTS OF GIBBERELLIC ACID, α NAPTHALENE ACETIC ACID AND MALEIC HYDRAZIDE ON SEED GERMINATION AND SERVIVAL AND MORTALITY PERCENTAGE ON CHILLI (*Capsicum annuum* L.)

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Abstract

In 2003-04 and 2004-05, the Department of Botany at Hindu College, Moradabad studied the effects of GA3, NAA, and MH on Chilli (Capsicum annuum L.) variety Suryamukhi. 100 Capsicum annuum L. variety Suryamukhi seeds were treated with 5, 10, 25, 50, and 100 ppm growth regulators for 24 hours. Seeds treated with GA3 at 5ppm showed the greatest germination (120.69%) and survival (91.43%) above the control (8.57%). 5-50 ppm treatments enhanced seedling growth. 5ppm GA3 produced the longest seedlings (11.72cm) and roots (5.28). 50ppm seeds had the longest shoots (7.72cm). 100 ppm seeds had the lowest germination, survival, mortality, and seedling growth. NAA treatments enhanced germination and survival up to 10 ppm. The maximum gemination (125.86%), survival (95.89%), and mortality (4.11%) were obtained in 10ppm treatment above the control, but it declined in 25 to 100ppm concentration. Increased seedling growth to 25 ppm. 25 ppm NAA seeds had the longest seeding (11.37cm) and shoot length (7.55cm), whereas 10 ppm NAA seeds had the highest root length (4.20cm). All MH doses inhibited seed germination. 100ppm treated seeds had lower germination (67.24%), survival (58.41%), and mortality (43.59%) than the control. MH inhibited shoot and root growth.Plant growth regulators (PGRs) play important roles in regulating plant growth.

Keywords: *Gibberellic Acid , A Napthalene Acetic Acid, Maleic Hydrazide*

INTRODUCTION -

Since 1936, when Cholodny firstly proposed the use of growth hormones in agriculture, a large number of growth hormones have been used on different crop plants to study their effects on various aspects. Such type of work on chilli is very scantly, whereas the crop is economically much important. Therefore, the present work has been under taken to study the effects of gibberellic acid (GA_3), α-naphthalene acetic acid (NAA) and maleic hydrazide (MH) on seed germination, survival and seedling growth of chilli (Capsicum annuum L.)

The effects of gibberellins on seed germination and seedling growth have been studied in various crop viz. radish (Sharma et al., 1990; Bhople et al., 1998), okra (Singh and Kumar, 1998), papaya (Pandit et al., 2001 ; Beniwal et al., 2005) and green gram (Tickoo et al., 2006) etc. GA_3 treatment promoted seed

germination and increased height, fresh weight and dry weight of seedling in ber (Singh et al., 2004). Singh & Murty (1987) and Singh (1989) observed in Cassia sp. that 50 and 100ppm GA_3 promoted seed germination while higher concentrations slightly reduced the germination percentage as well as seedling height.

Singh and Kumar (1998) reported that presowing seed treatment of GA_3 promoted seed germination in okra. Haque et al. 5(2006) observed that seeds treated with 50 & 100 ppm concentrations of GA_3 improved seed germination percentage and seedling growth in Chrysanthemum sp.

The effects of auxins on seed germination and seedling growth have been studied in different crops viz. Cassia glauca (Singh, 1989), seabuckthorn (Sankhyan et al., 2004) and Polianthus tuberosa (Sagar et al., 2005). Bhople et al. (1998) have studied that presowing treatment with 100 ppm NAA increased germination percentage in radish. Effects of different concentration of NAA have also been studied on seed germination and seedling growth in chilli. Hariharan and Unikrishnan (1983) have reported that 30, 50 and 70 ppm doses of α NAA showed early germination in chilli.

The effects of maleic hydrazide on seed germination and seedling growth have been studied in various crops viz. radish (Sharma et al., 1990), maize (Castro et al., 1987), onion (Gregoriou, 1998) and tuberose (Sagar et al., 2005). Singh and Murty (1987) have studied that presoaking seeds of Cassia glauca with 50, 100, 200 and 500 ppm MH showed decrease in germination with increasing concentrations of hormone. Caldiz et al. (1997) have studied that the potato treated with 9 or 12 liter maleic hydrazide/hectare delayed sprouting time but improved the yield.

MATERIALS AND METHODS -

100 seeds of Capsicum annuum L. variety Suryamukhi were treated with 5,10, 25, 50 and 100 ppm aqueous solutions of each of GA_3, NAA and MH for 24 hours. Seeds for control were soaked in distilled water for the same duration. There were 16 treatments including control and each was replicated 4 times with 25 seeds per enamel tray containing sterilized and moist sand. Germination was observed daily till constancy and seedling growth was studied when seedlings were 20 days old.

Following observations were recorded

1. Germination percentage
2. Survival and mortality percentage
3. Seeding growth

OBSERVATIONS -

Germination:-

The experimental findings on seed germination are presented in table 1 and fig.5-7. Germination occurred in all the treatments. There was only 58% germination in control and therefore, in all the treatments, germination % was calculated in relation to control. 5, 10 and 25 ppm concentrations of GA_3 showed an increase in seed germination over the control. Maximum germination % has been observed in 5 ppm treatment. 10 and 25 ppm treatments also showed higher germination percentage as compared to control but it was decreased with the increasing concentration as compared to 5 ppm GA_3 treatment. Higher doses i.e. 50 and 100 ppm GA_3 decreased the germination percentage and minimum germination percentage was observed in 100 ppm which was about 28% lower as compared to control (fig.1).

In case of NAA treatments, the germination percentage was increased with the increasing concentration upto 10 ppm but it was decreased with the increasing concentrations from 25 to 100 ppm, however, in 25 ppm treatment germination % was about 7% higher as compared to control. In NAA treatments, maximum germination percentage (125.86%) was recorded in 10 ppm, while minimum germination percentage (94.83%) was observed in 100 ppm (fig.2).

Perusal of data presented in table 1 shows and fig.7 that MH decreased the germination percentage in all the concentrations used. There was a gradual incrase in the reduction in germination percentage with the increasing doses of the MH. Maximum reduction of 33% was observed in 100 ppm treatment of MH. Thus, a linear dose/effect relationship has been observed in MH treatments.

Survival and Mortality: -

The observations on survival and mortality percentage are documented in table 1 and fig.8-13. The survival percentage was increased in 5 to 25 ppm GA_3 treatments and it was decreased in 50 and 100 ppm concentrations used as compared to control. Among GA_3 treatments, maximum survival percentage was found in 5 ppm treatment and there was a gradual decrease in survival percentage with the increasing concentrations of GA_3 used with minimum survival percentage of 69.05% in 100 ppm. Maximum mortality percentage (30.95%) was observed in 100 ppm GA_3 treatment.

Lower doses of NAA upto 10 ppm showed an increase in survival percentage and decrease in mortality percentage. At higher doses of NAA (25 to 100 ppm), the survival percentage was decreased with the increasing concentrations but it was still higher in 25 and 50 ppm as compared to control. Maximum germination percentage (95.89) and minimum mortality percentage has been observed in 100 ppm NAA treatment.

In case of MH treatments, the survival percentage was gradually decreased and mortality percentage was increased with the increasing concentrations of MH used, however in 5 and 10 ppm treatments, survival percentage was slightly higher as compared to control. It is clear that MH concentrations showed an inhibitory effect on survival percentage.

Among all the 15 treatments, maximum survival percentage (95.89%) with minimum mortality (4.11%) has been observed in 10 ppm NAA treatment while minimum survival percentage (58.41) with maximum mortality (43.59%) has been reported in 100 ppm MH treatment.

Table –1

Effect of GA_3, NAA and MH on germination, survival and mortality percentage of seedlings in chilli (Capsicum annuum L.)

Treatments	Number of Seed germinated	Germination % of control	Number of plants survived	Survival % of germination	Mortality %
Control	58	-	48	82.76	17.24
GA3 5 ppm	70	120.69	64	91.43	08.57
10 ppm	66	113.79	58	87.88	12.12
25 ppm	60	103.45	51	85.00	15.00
50 ppm	50	86.21	39	78.00	22.00
100 ppm	42	72.41	29	69.05	30.95
NAA 5 ppm	61	105.17	55	90.16	09.84
10 ppm	73	125.86	70	95.89	04.11
25 ppm	62	106.90	54	87.10	12.90
50 ppm	57	98.28	48	84.21	15.79
100 ppm	55	94.83	43	78.18	21.82
MH 5 ppm	57	98.28	49	85.97	14.03
10 ppm	54	93.10	45	83.33	16.67
25 ppm	48	82.76	36	75.00	25.00
50 ppm	44	75.86	30	68.18	31.82
100 ppm	39	67.24	22	58.41	43.59

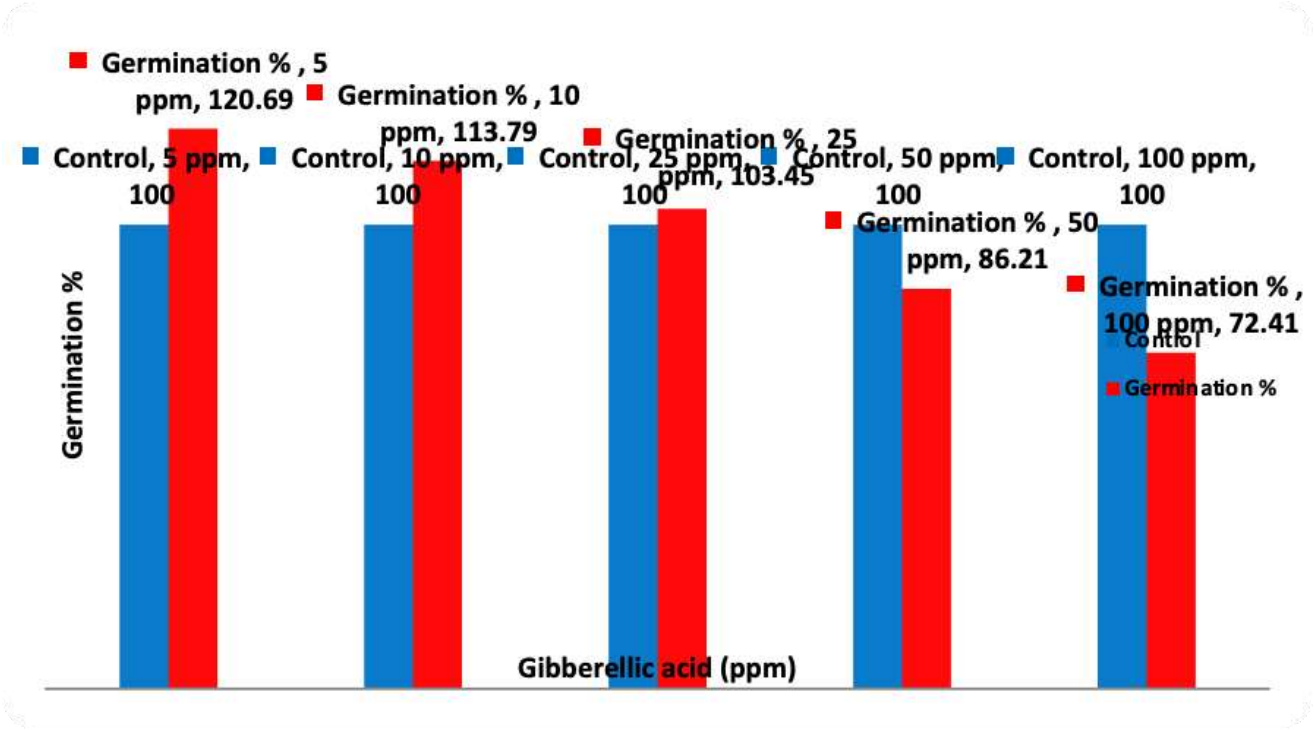

Fig. – 1: Effect of gibberellic acid on germination percentage in chilli

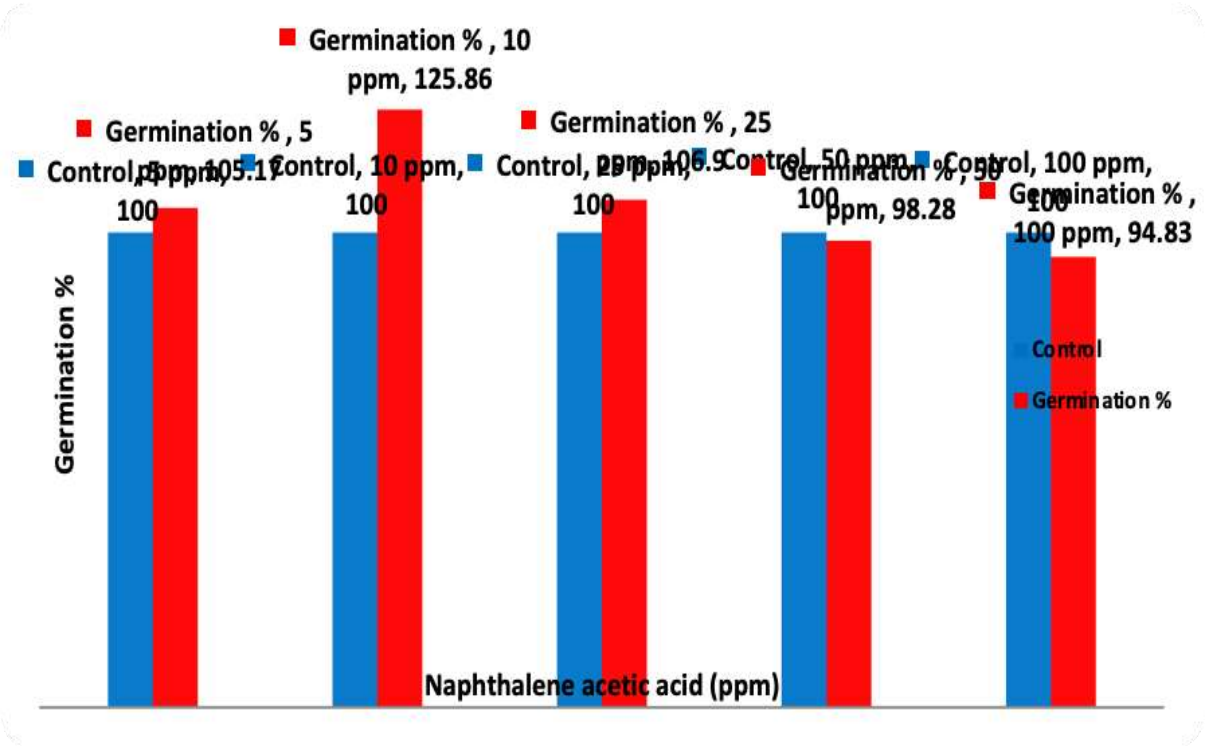

Fig. – 2: Effect of naphthalene acetic acid on germination percentage in chilli

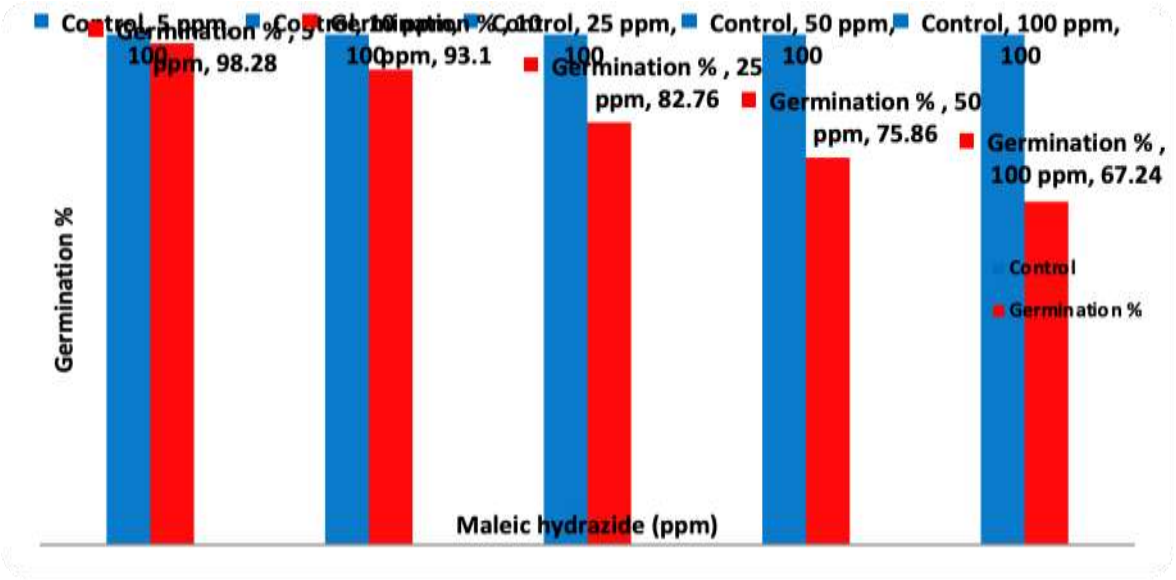

Fig. – 3: Effect of maleic hydrazide on germination percentage in chilli

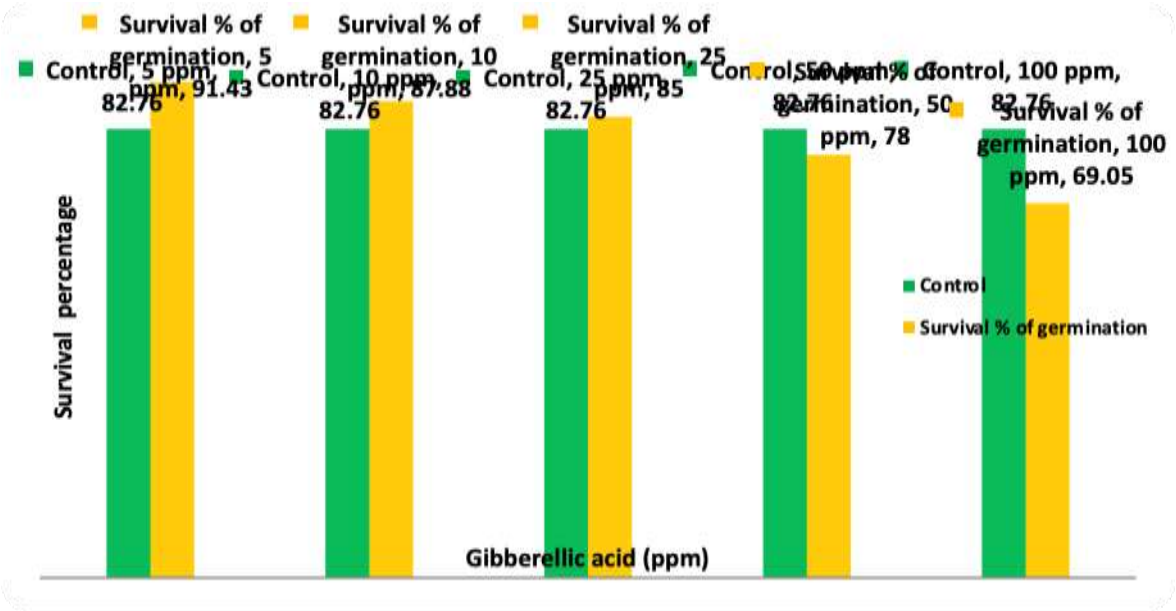

Fig. – 4: Effect of gibberellic acid on survival percentage in chilli

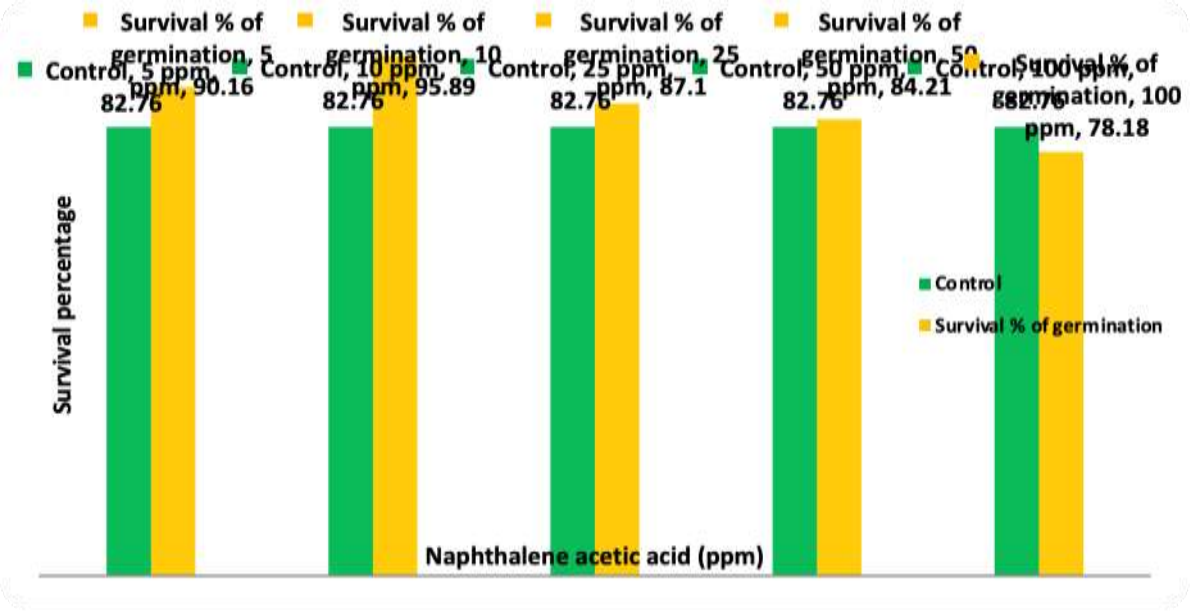

Fig. – 5: Effect of naphthalene acetic acid on survival percentage in chilli

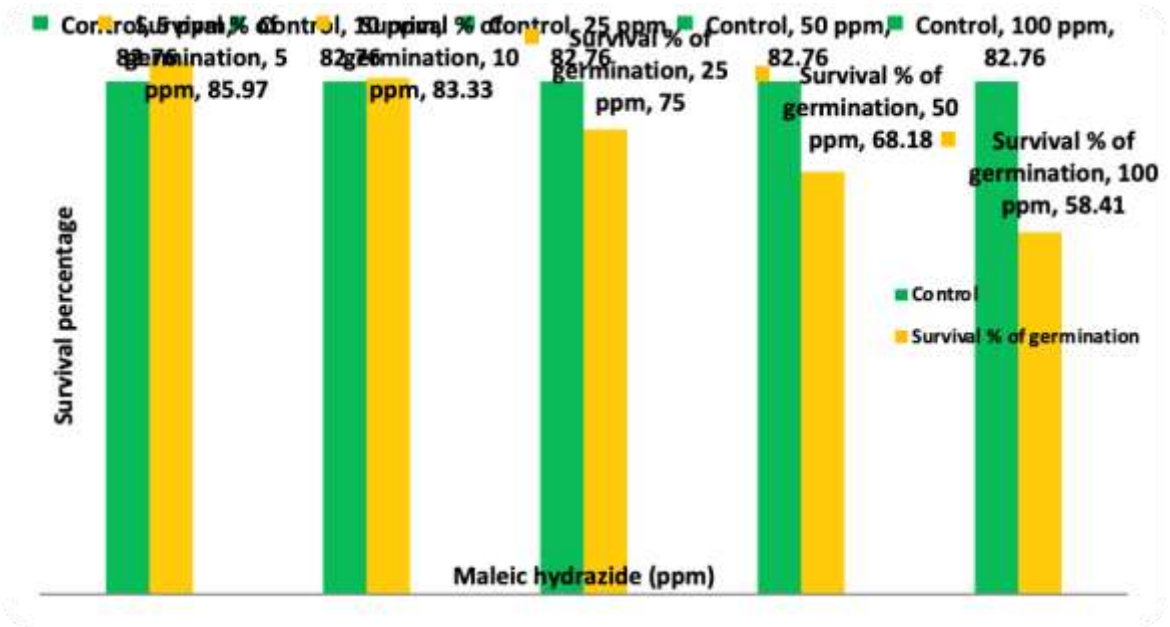

Fig. – 6: Effect of maleic hydrazide on survival percentage in chilli

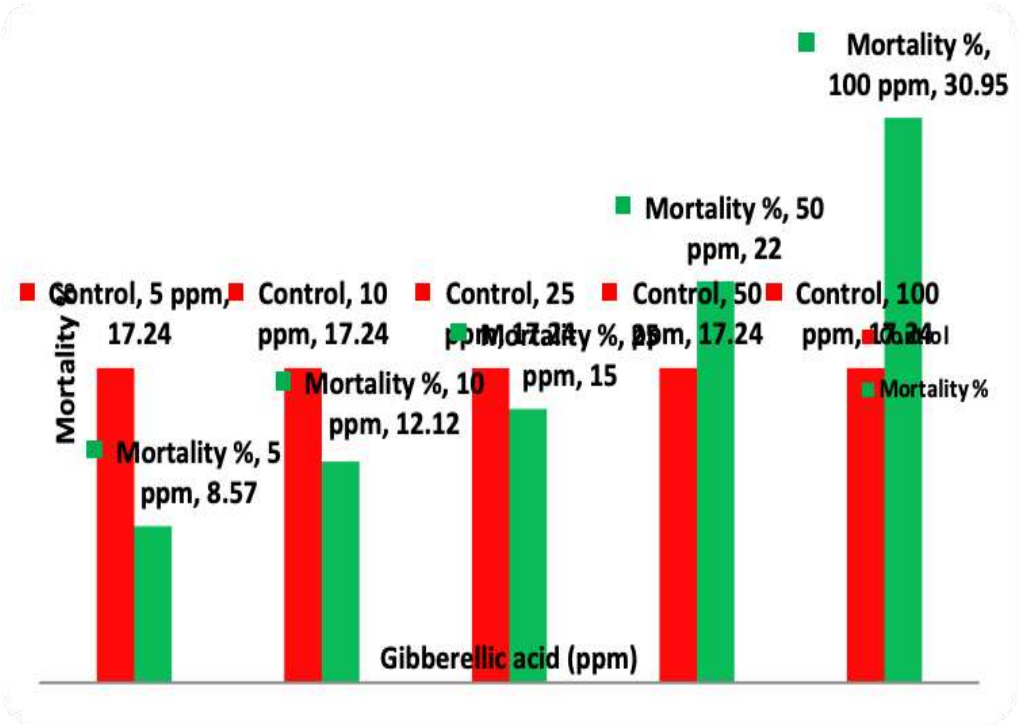

Fig. – 7: Effect of gibberellic acid on mortality percentage in chilli

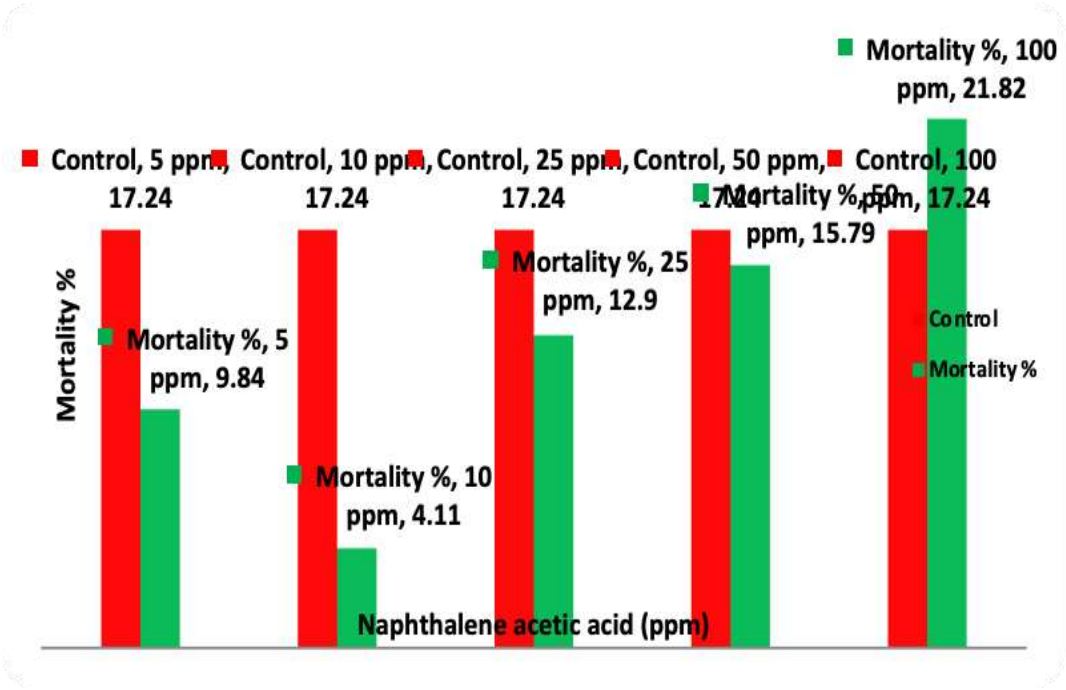

Fig. – 8: Effect of naphthalene acetic acid on mortality percentage in chilli

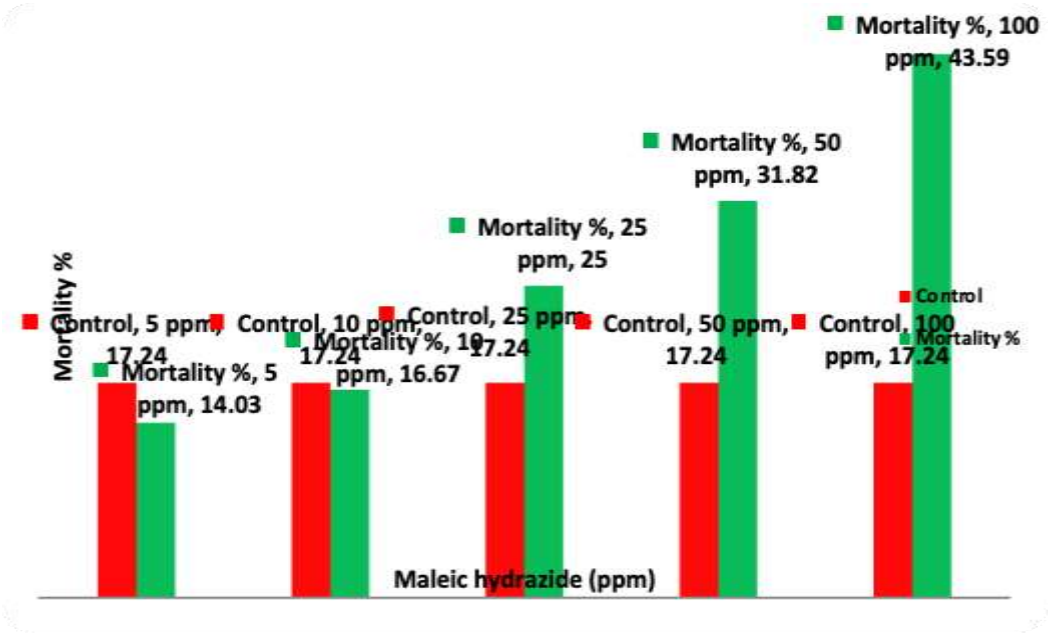

Fig. – 9: Effect of maleic hydrazide on mortality percentage in chilli

Seedling growth:-

The perusal of data presented in table 2 ,fig.14 and photoplates 1-6 shows that 5 to 50 ppm GA_3 treatments increased significantly the length of seedling and shoot but this promotery effect was gradually decreased with the increasing concentrations used. The root length was increased significantly in 5 and 10 ppm while it was decreased in 25, 50, and 100 ppm GA_3 treatments as compared to control.

In case of NAA treatments the seedling growth was gradually increased with the increasing concentrations from 5 to 25 ppm but it was gradually decreased in 50 and 100 ppm NAA treatments. In 10 to 50 ppm NAA treatments, the increase in seedling growth was found to be most significant. NAA showed an insignificant effect on root length except a significant increase in root length in 100 ppm treatment.

Table –2

Effect of GA_3, NAA and MH on seedling growth in chilli (Capsicum annuum L)

Treatments		Seedling length	Shoot length	Root length
		Mean ± SE	Mean ± SE	Mean ± SE
Control		9.42 ± 0.380	5.82 ± 0.180	3.60 ± 0.446
GA3	5 ppm	11.72 ± 0.467**	6.44 ± 0.161**	5.28 ± 0.265**
	10 ppm	11.20 ± 0.265**	7.02 ± 0.141**	4.18 ± 0.286
	25 ppm	10.77 ± 0.267**	7.19 ± 0.050**	3.58 ± 0.321
	50 ppm	10.57 ± 0.243**	7.72 ± 0.283**	3.29 ± 0.338
	100 ppm	9.86 ± 0.275	7.28 ± 0.145**	2.14 ± 0.218**
NAA	5 ppm	9.78 ± 0.388	6.10 ± 0.267	3.68 ± 0.320
	10 ppm	11.25 ± 0.329**	7.05 ± 0.131**	4.20 ± 0.221**
	25 ppm	11.37 ± 0.169	7.55 ± 0.225**	3.82 ± 0.259
	50 ppm	10.83 ± 0.226**	7.02 ± 0.102**	3.61 ± 0.281
	100 ppm	9.87 ± 0.380	6.45 ± 0.207**	3.42 ± 0.170
MH	5 ppm	9.26 ± 0.401	5.72 ± 0.292	3.54 ± 0.163
	10 ppm	8.94 ± 0.441	5.51 ± 0.297	3.43 ± 0.146
	25 ppm	8.48 ± 0.383*	5.26 ± 0.268*	3.22 ± 0.121**
	50 ppm	7.76 ± 0.229**	4.85 ± 0.174**	2.91 ± 0.550**
	100 ppm	5.63 ± 0.218**	4.01 ± 0.338**	1.62 ± 0.150**

* Significant at P = .05

** Significant at P = .01

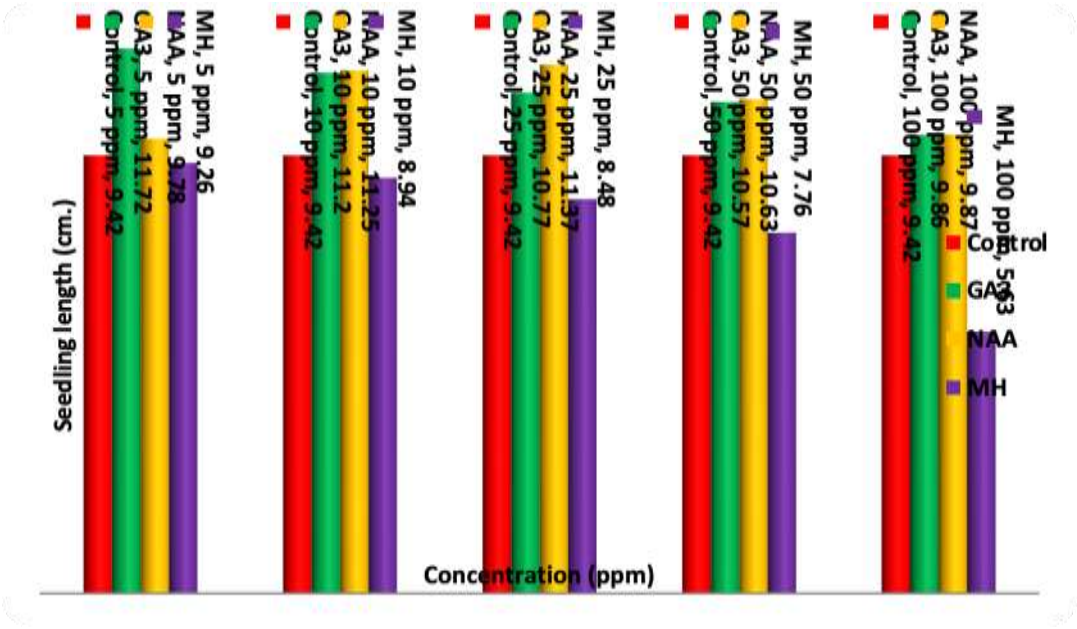

Fig. – 10:Effect of GA_3, NAA & MH on seedling growth in chilli

Maleic hydrazide showed an inhibitory effect on seedling growth. Seedling length, shoot length and root length were decreased in all the concentrations of MH used as compared to the control. The inhibitory effect has been found to be most significant in 50 and 100 ppm MH treatment.

1.5ppm 2. 10ppm 3. 25ppm 4. 50ppm 5. 100ppm

Photoplate 1: seed treatment of GA3

1.5ppm 2. 10ppm 3. 25ppm 4. 50ppm 5. 100ppm

Photoplate 2: seed treatment of NNA

1. 5ppm 2. 10ppm 3. 25ppm 4. 50ppm 5. 100ppm

Photoplate 3: seed treatment of MH

Conclusion: The experimental findings on seed germination presented in table 1 revealed that lower doses of GA_3 (5, 10 and 25ppm) increased the germination percentage over the control while higher doses

i.e. 50 and 100 ppm decreased the germination percentage. 5 ppm GA_3 showed maximum germination percentage and there was a gradual decrease in germination percentage with the increasing concentration of GA_3. NAA treatment promoted the germination percentage at 5 and 10 ppm and then there was a gradual decrease in germination percentage with the increasing concentrations of NAA from 25 to 100 ppm. The observations that maleic hydrazide (5-100 ppm) inhibited the seed germination and there was a gradual increase in reduction of germination. Application of GA_3 increased the survival percentage upto 25 ppm, however, there was a gradual decrease in survival percentage with increasing concentration of GA_3. At 50 and 100 ppm GA_3, the survival percentage was lower than that of control. In NAA treatments maximum survival percentage was observed at 5 ppm and there was a gradual decrease in survival percentage with the increasing concentration of NAA in chilli. 5 ppm MH treatment promoted the survival percentage while higher doses decreased it and the reduction was gradually increased with the increasing concentrations of MH.

REFERENCES

1. Beniwal,V.S., Dahiya, D.S., Sehrawat, S.K. and Daulta, B.S. 2005: Effect of GA_3 on in vitro seed germination of different cultivars of papaya. Haryana J. Hortic. Sci. **34**(3-4): 236-237.

2.Bhople, S.R., Dod, V.N., Bharad, S.G., Gopal, S.V., Jadhao, B.J. 1998 :

Effect of growth regulators on seed production of radish

(Raphanus sativus L.) cv Pusa chetki. Journal of soils and crops. **8**

(2): 214- 215

3. Caldiz, D.O., Fernandiz, L.V., Marco, F. and Clua, A. 1997: Effect of maleic hydrazide on field, dry matter content and sprouting in potatoes (Solanum tuberosum L. cv. Spurita). So-Revista- de-Faculted de Agronomia La Plato. **102**(2) : 163-173.

4. Castro, P.R.C., Henrique, A.A., Fumis, T.F., Babboni, Junior, A.C. and Minarelli. 1987 : Action of growth regulators and plant stimulants on germination in maize and tomatoes. Anais da Escola superior de Agricultura Luiz-de Queiroz, Universidade – de Sao Paulo. **44**(1): 359-368.

5. Cholodny, N. 1936 : Hormonization of grains. C.R. (Dokl) Acad. Sci. 3,9.

6. Hariharan, M. and Unnikrishnan, K. 1983 : Enhanced fruit size and seed set in Capsicum annuum L. by NAA treatment. Acta Botanica Indica. **11** : 161-163.

7. Haque, S., Farooqui, A.H.A. and Khan, A. 2006 : Improvement of seed germination in Chrysanthemum cinerariaefolium (pyrethrum) by GA_3, ethrel and pre-chilling. Physiol. Mol. Biol. Plants. **12**(3): 221-228.

8. Pandit, V.K., Nagarajan, S. and Sinha, J.P. 2001 : Improving papaya (Carica papaya) seed germination and seedling growth by pre-sowing treatments. Indian J. Agril. Sci. **71**(11): 704-706.

9. Singh, A.K., Bagle, B.G. and Tivedi, Meena, 2004 : Effect of GA_3 and sucrose on seed germination and seedling growth in ber under semi arid conditions. The Orissa Journal of Horticulturae. **32**(1): 78-81.

10. Singh, C. 1989 : Changes in seed germination and seedling growth processes induced by various growth regulators in Cassia glauca Lamb. Acta Botanica Indica. **17** : 68-75.

11. Singh, C. and Murty, Y.S. 1987 : Studies on the effect of various growth regulators on seed germination and seeding growth of Cassia fistula L. Acta Botanica Indica. **15** :206-212.

12. Singh, P.V. and Kumar, J. 1998 : Effect of GA_3 as presowing seed treatment and different levels of nitrogen on germination, growth, flowering and yield of okra (Abelmoschus esculentus L. Moench). India J. Agril. Res. **32** (1) : 31-36.

13. Sharma, Y.P., Vatsa, V.K. and Gupta, H.O. 1990 : Effects of some bioregulants on germination and seedling growth of Raphanus sativus L. Vegetos. **3** (2): 193-196.

14. Tickoo, J.L., Mir, Parvaz A. and Singh, D. 2006 : Effect of pre-sowing seed treatment with growth regulators on yield and yield contributing characters in mungbean (Vigna radiata L. Wilczek). Indian J. Genet. 66(3) : 218-220.