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EFFECT OF THIO-UREA SEED TREATMENT ON PLANT GROWTH AND YIELD OF SEED POTATO CROP PRODUCTION

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ABSTRACT
The present study was carried out to study the effect of thio-urea concentrations as seed treatment (1, 3, 5 and 7%) on plant growth and yield of potato variety Atlantic. Experiment was randomized block design with three replications for each concentration. the observations of the study was emergence percentage and days taken for emergence, plant growth *i.e.* plant height and number of stem per plant, number of tuber per plant and total yield, the haulm was killed at 75 days after planting and the data for number of tuber/plant and total yield were taken at 25 days after haulm killing at harvesting. The observation of thio-urea as seed treatment on days taken for emergence shows that 1% thio-urea is effective for early emergence (13 ±1.33 days) in comparison to control (14 ±0.33 days), but, the number of stem per plant and plant height in the present study not shows any significant deference between treatments, all the treatment shows almost similar results in comparison to control. The maximum number of tuber per plant was reported in 1% (6 ±0.88) concentration of thio-urea, followed by 3% (6 ±0.57), 5% (6 ±0.00), 7% (5 ±0.33) and control (4 ±0.66), the increase in thio-urea concentration shows decreases in number of tuber per plant. The highest yield (MT/Ha) were reported in 1% (16.1 ±1.45) concentration followed by 3% (13.0 ±0.32), Control (13.0 ±1.84), 5% (10.2 ±0.82) and 7% (8.0 ±0.47) concentration. The present study indicates that 1% thio-urea as seed treatment is found suitable in comparison to control in aspect of plant growth and yield of potato.

KEY WORDS: Thio-urea, seed treatment and potato.

INTRODUCTION

As a crop of high biological value for its protein and a substantial amount of vitamins, minerals and trace elements, potato is undoubtedly a very important crop in the country (Gebre and Sathyanarayana, 2001). Potato has the fourth rank amoung foods in terms of importance after wheat, rice and corn in the world (Germchi, *et al.*, 2011). Higher yield and proper tuber size in terms of seed potato and ware potato is a very important aspect to full fill the requirement of seed potato producers/ farmers and for all the population of the country, because of increasing consumption of potato day by day. With this aim the present study was done to evaluate the effect of Thio-urea treatment on plant growth and potato yield.

Dormancy of potato tuber is defined as the physiological state in which autonomous sprout will not occur, even when the tuber is placed under ideal conditions for sprout growth (Rehman *et al.*, 2001). Among the chemicals applied for breaking down the potato nodes dormancy, thio-urea, a catalyze inhibitor which tiggers potato tubers germination and healing tubers injuries especially when it is applied in an appropriate concentration (Mani *et al.*, 2013). Also many studies reported that thio-urea treatment is not only more efficient to break dormancy but it increases also sprouts number, comparing to other chemicals like IAA and GA3 (Germchi *et al.*, 2010). In addition, earlier workers also reported that thio-urea has great influence on yield and quality of potato tubers (Panah *et al.*, 2007), but the impact of thio-urea on plant growth and on quality of potato tubers is not well established. According to Rahman *et al.*, 2003; Panah *et al.*, 2007; Mani *et al.*, 2011, treating tubers with thio-urea is efficient to break dormancy, but its impact on yield is not well established. Thus the present experiment was conducted to determine the effect of thio-urea on plant growth and yield of potato variety Atlantic.

MATERIALS & METHODS

The study was carried out in 2014 –15 cropping season in the agriculture research farm at UCBMS & H, Dehradun, Uttarakhand. Potato tubers of variety Atlantic (35–45 mm size) was taken as planting material. The effect of thio-urea chemical was examined as seed treatment before planting. In seed treatment potato tubers were wet by solution of thio-urea (1, 3, 5 and 7% concentration, indicated as T1, T2, T3 and T4 respectively) followed by control (T5 - without thio-urea seed treatment) done with spray method and were left to dried out till planting (Table-1). Experiment was randomized block design with three replications for each concentration. Each concentration having 180 tubers in three replications, the observations of the study was emergence percentage and days taken for emergence, plant growth *i.e.* plant height and number of stem per plant, number of tuber per plant and total yield, the haulm was killed at 75 days after planting and the data for number of tuber/plant and total

yield were taken at 25 days after haulm killing at harvesting. Tubers were planted in field at the spacing of 68.6 cm x 20 cm. The amount of fertilizers were used as 420 kg/Ha Urea, 350 Kg/Ha SSP, 250 Kg/Ha DAP, 300 Kg/Ha MOP and 30 Kg/Ha Zinc in whole cropping period. During the experiment period, from November 2014 to January 2015, each day show minimum of 5.9 ^{0}C and maximum of 24.6 ^{0}C air temperature. The soil temperature was minimum of 10.3 ^{0}C and maximum of 22.3 ^{0}C.

RESULTS & DISCUSSION

Effect of thio-urea seed treatment on emergence and plant growth

To observe the emergence percentage and days taken for emergence, data were collected on daily basis, the percentage of emergence is 100% in all the concentrations but the duration were differ from each other (Table-1, Fig. -1), the minimum days taken for emergence was reported in T1 (13 ±1.33 days) followed by T5 (14 ±0.33 days), T2 (17 ±1.45 days), T4 (20 ±1.66 days) and T3 (21 ±1.00 days). The number of stem per plant was observed at 35 days after planting (Table-1, Fig. -2), the maximum no. of stem were reported in T2 (4.3 ±0.26 stem/plant) followed by T1 and T5 (3.5 ±0.13 stem/plant), T3 and T4 (3.3 ±0.24 and 3.3 ±0.06 stem/plant respectively) concentrations. The plant height was observed at 45 days after planting (Table-1, Fig. -3), the maximum plant height (cm.) were reported in T1 (10.9 ±0.87) followed by T5 (10.7 ±0.78), T2 (10.5 ±0.54), T3 (9.4 ±0.13) and T4 (9.1 ±0.54) concentrations. The effect of thio-urea as seed treatment for dormancy breaking of potato tubers were reported earlier by so many workers and found it most suitable chemical for dormancy breaking (Germchi *et al.*, 2011, Mani *et al.*, 2012 & 2013, Swaminathan, 1980). Thio-urea play a role in plant growth also, the observation of present study on days taken for emergence shows that 1% thio-urea is effective for early emergence (13 days) in comparison to control (14 days), it is also observed that with the increasing concentration of thio-urea the days taken for emergence is also increased *i.e.* lower concentration of thio-urea is much effective for early emergence, similarly according to Germchi *et al.*, 2011, thio-urea triggers potato tubers germination and not only facilitates germination, but also produces more than one sprout in each eyes of potato. Pietkiewicz, 1983 was declare that treating tubers by mixing GA3 with 1 ppm concentration and thio-urea with 1% concentration increases plant growth and decreases dormancy period significantly. But, the number of stem per plant and plant height in the present study not shows any significant deference between treatments, all the treatment shows almost similar results in comparison to control *i.e.* it seems that although thio-urea 1% prompt early emergence but not play any role in plant growth.

Effect of thio-urea seed treatment on number of tuber per plant and total yield

The number of tuber per plant was observed at 25 days after haulm killing at harvesting (Table-1, Fig. -4), the maximum number of tuber per plant were reported in T1 (6 ±0.88) followed by T2 (6 ±0.57), T3 (6 ±0.00), T4 (5 ±0.33) and T5 (4 ±0.66) concentrations, this result is supported by Mani *et al.*, 2013, who observed that using thio-urea the number of tuber per plant and dry matter of potato plants increased significantly. The yield was observed at 25 days after haulm killing at harvesting (Table-1, Fig. -5), the highest yield were reported in T1 (16.1 ±1.45) followed by T2 (13.0 ±0.32), T5 (13.0 ±1.84), T3 (10.2 ±0.82) and T4 (8.0 ±0.47) concentrations. Present study shown that thio-urea concentration shows positive influence on number of tuber and total yield in comparing to control, similarly Bajji *et al.*, 2007, have also reported significant effect on tuber yield. It is also observed in the present study that number of tuber per plant and total yield (MT/Ha) was decrease with increases in thio-urea concentrations.

TABLE 1: Effect of thio-urea seed treatment on plant growth and yield of seed potato

S.N.	Concentration	Days Taken for Emergence	No. of Stem/ Plant	Plant Height (Cm.)	No. of Tuber/Plant	Yield (MT/Ha)
1	T1	13 ±1.33	3.5 ±0.13	10.9 ±0.87	6 ±0.88	16.1 ±1.45
2	T2	17 ±1.45	4.3 ±0.26	10.5 ±0.54	6 ±0.57	13.0 ±0.32
3	T3	21 ±1.00	3.3 ±0.24	9.4 ±0.13	6 ±0.00	10.2 ±0.82
4	T4	20 ±1.66	3.3 ±0.06	9.1 ±0.54	5 ±0.33	8.0 ±0.47
5	T5	14 ±0.33	3.5 ±0.13	10.7 ±0.78	4 ±0.66	13.0 ±1.84
	C.D. at 5%	4.459*	0.576*	2.191*	1.517*	2.889**
	S.E. (m)	1.368	0.177	0.672	0.465	0.887
	S.E. (d)	1.935	0.250	0.951	0.658	1.254
	C.V.	1.832	8.580	11.492	15.397	12.728

**Significant at 1%, **Significant at 5%*

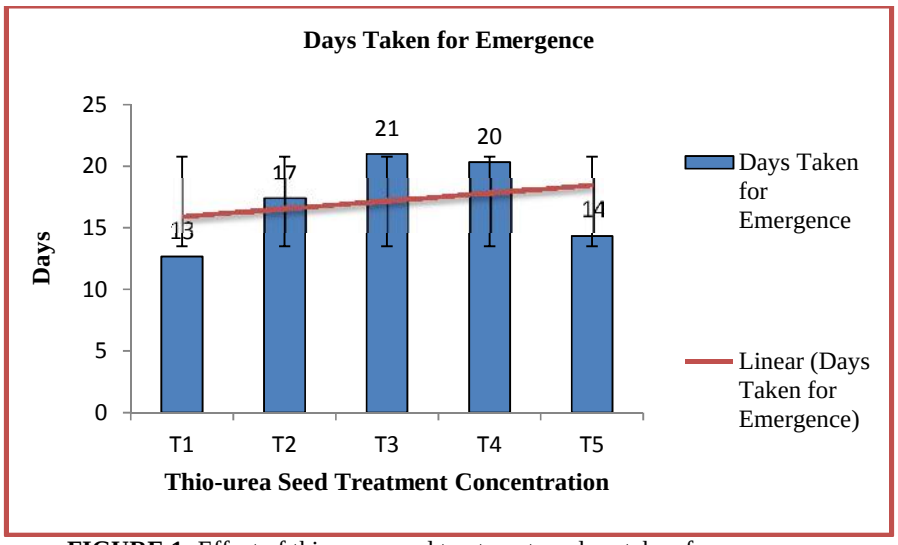

FIGURE 1: Effect of thio-urea seed treatment on days taken for emergence

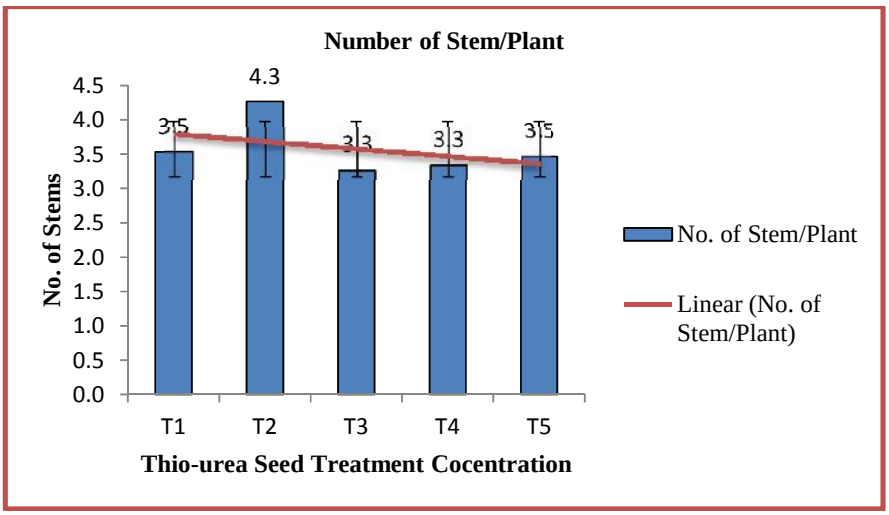

FIGURE 2: Effect of thio-urea Seed Treatment on Number of Stem per Plant

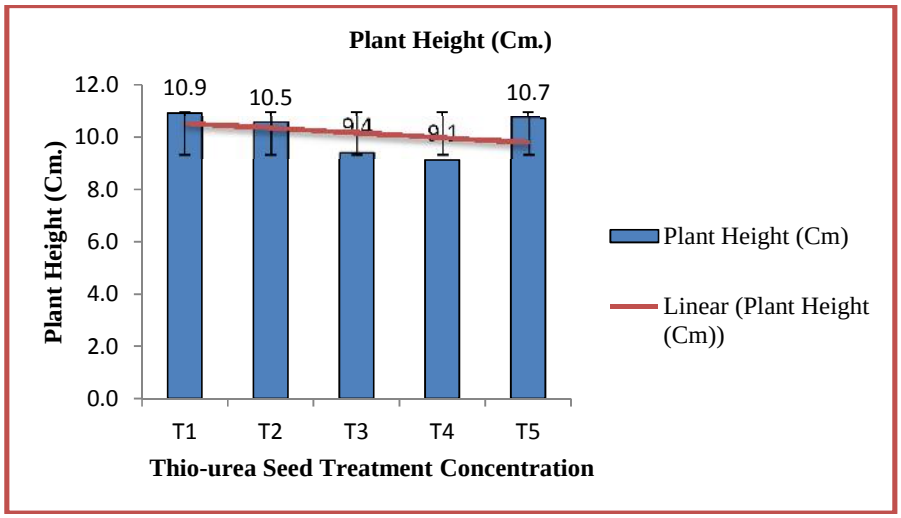

FIGURE 3: Effect of thio-urea Seed Treatment on Plant Height

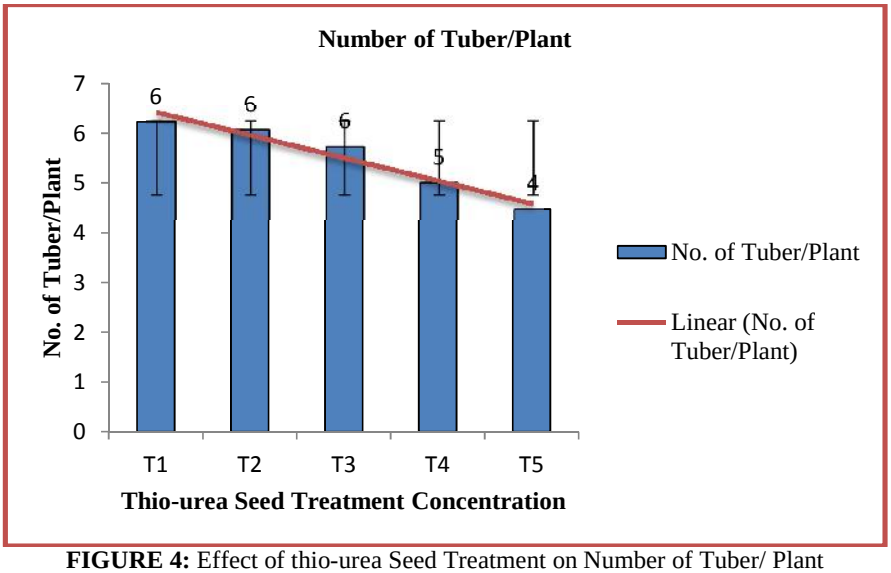

FIGURE 4: Effect of thio-urea Seed Treatment on Number of Tuber/ Plant

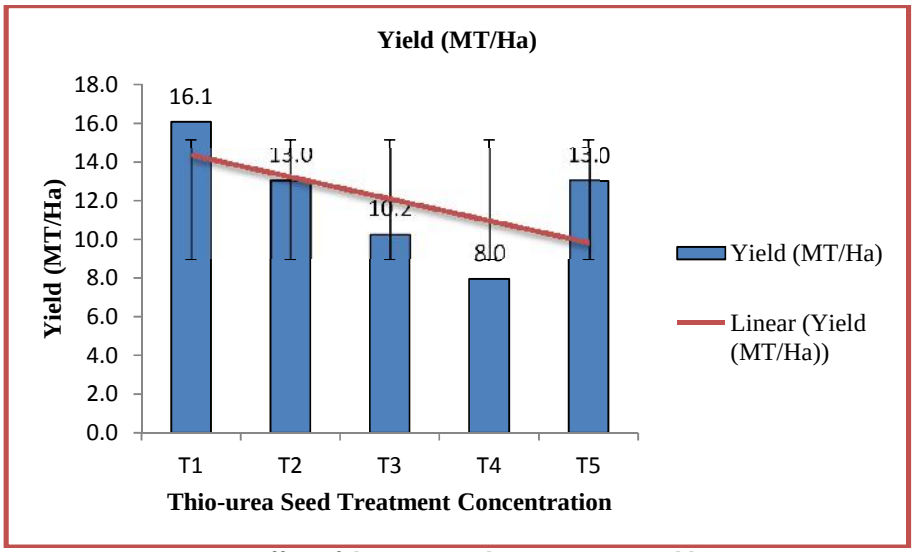

FIGURE 5: Effect of thio-urea Seed Treatment on Yield (MT/Ha)

CONCLUSION

The present study indicates that 1% thio-urea is found most suitable concentration for early emergence, higher number of tuber per plant and highest yield of potato crop. It is also observed that with the increases in thio-urea concentration more than 1%, days taken for emergence as well as yield is also decreases.

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