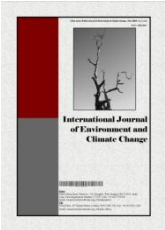

International Journal of Environment and Climate Change

12(10): 1067-1076, 2022; Article no.IJECC.79663
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Pre-sowing Seed Treatment of Chemicals, Botanicals, Plant Growth Regulators on Growth, Yield and Yield Attributing Traits of Linseed (*Linum usitatissimum* L.) under Late Sowing Conditions var. Uma

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJECC/2022/v12i1030900

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/79663

Short Communication

Received 01 February 2022
Accepted 05 April 2022
Published 18 June 2022

ABSTRACT

The experiment was conducted at Field Experimentation and Farm Research Centre, Department of Genetics and Plant Breeding, (Rabi season, 2020-21) Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The experimental material for present experiment comprised of thirteen priming treatments on linseed seed. The experiment was conducted in Randomized Block Design (RBD) with three replications. Linseed seeds of variety Uma was subjected to various pre sowing treatments like $MnSO_4$,$FeSO_4$ Pongamia leaf powder, Arappu leaf powder, Notchi leaf powder, Kinetin at various concentrations along with distilled water control. The study revealed that linseed seeds treated with Pongamia leaf powder T_6 (5%) showed maximum field emergence (97.48%), plant height 60 days (77.46cm) and 90 days (92.69cm) no of primary branches per plant (5.97),no of seeds per capsule (8.95),no of capsules per plant (25.91),

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test weight (9.43), seed yield per plant (4.78g), seed yield per plot (128.4g), biological yield (8.26), harvest index (79.53) and reduced days to 50% flowering (65.89), days to maturity (115.89), followed by kinetin T_{12} 50(ppm), in comparison to control T_0.

Keywords: Arappu leaf powder; $FeSO_4$; kinetin; $MnSO_4$; notchi leaf powder; pongamia leaf powder.

1. INTRODUCTION

Linseed (*Linum usitatissimum* L.) is an annual self-pollinated crop with origin in the Middle East or the Indian regions [1]. The generic name *Linum* derives from Celtic word "lin" means "thread" and the species name *usitatissimum* (Latin word) means "very useful". *Linum usitatissimum*, only cultivated species of the genus *Linum* of family Linaceae is cultivated for oil from the beginning of agriculture eight thousand years ago and somewhat later for fibre [2]. India ranks second in area after Canada in the world, but is at fourth place in term of production after Canada, China and U.S.A. In term of productivity, India (449kg/ha) is far below to Canada (1492 kg/ha), U.S.A (1484 kg/ha), Egypt (1465 kg/ha) [3]. Linseed is a *Rabi* crop in India which is a member of family Linaceae. Linseed (*Linum usitatissimum* L.) is an erect annual herbaceous plant 30-120 cm, in height with slender glabrous, grayish green stem. Flowers are showy, variously shaped regular, hermaphrodite, pentamerous, hypogynous and borne in loose terminal raceme or open cyme with blue, white or pink colour. *Linum usitatissimum* L. is the only species with non-dehiscent or semi- dehiscent capsules for modern cultivation of the family Linaceae. It contains up to 10 smooth, glossy an apple pip shaped, light brown color seeds which is 4-7 mm long. Linseed is predominantly self-pollinating. Natural cross pollination can occur at level of 6.75% by insects [4]. In recent years, the use of local botanicals has gained much importance, mainly among researchers, because of its high benefits in plant growth, yield and seed quality attributes [5,6]. Some botanicals like Neem extract, Arappu leaf powder, Notchi leaf powder, Pongamia leaf powder are used for seed treatment and various effect of them can be seen on growth and yield of a plant. Botanical seed treatment is extracted from naturally occurring sources based on botanical ingredients. It has synergistic effect on early and uniform seed germination and enhances tolerance to pest and disease during early crop stage [7,8]. Hormonal priming can also be done to attain good plant growth and productivity. Hormonal priming refers to treating seeds in hormones such as GA3, salicylic acid, ascorbate, kinetin, jasmonic acid etc. which helps in promoting seedling growth [9,10,11,12,13]. The present study was conducted to evaluate the effect of pre-sowing seed treatment of chemicals, botanicals and plant growth regulators on plant growth and yield of linseed and to find out suitable pre-sowing seed treatment favorable for linseed crop.

2. MATERIALS AND METHODS

The experimental material for present investigation comprised of thirteen priming treatments on linseed variety (Uma). The experiment was laid out in Randomized Block Design (RBD) with three replications. Seeds of (Uma) variety was obtained from CSAUAT Kanpur developed for high yield purpose and was subjected to various pre-sowing seed treatments like $Mnso_4$ T_1 (0.3%) and T_2 (0.5%), $Feso_4$ $_nT_3$ (0.3%) T_4 (0.5%), Pongamia leaf powder T_5 (3%) T_6 (5%), Arappu leaf powder T_7 (3%) T_8 (5%) Notchi leaf powder T_9 (3%) T_{10} (5%) Kinetin T_{11} (25ppm)T_{12} 50 (ppm) at various concentrations along with distilled water control $T_{0.}$

After pre-sowing seed treatments seeds were dried and then sowing was done in the field and following data was recorded field emergence percentage, plant height (cm), number of primary branches per plant, days to 50% flowering, days to maturity, number of capsules per plant, number of seeds per capsule, seed yield per plot (g), biological yield, harvest index, test weight in (g), seed yield per plant (g) data were collected from the field. The data was subjected to statistical analysis.

3. RESULTS AND DISCUSSION

All the treatments significantly affected growth and yield attributes. Here we will see about performance of various treatments depend on data which is recorded.

3.1 Field Emergence Percentage

The maximum field emergence percent (97.48%) was recorded with pongamia leaf

Table 1. Mean performance of field parameters of linseed

Treatments	Chemicals	FM	DFF	PH		NPBPP	DM	NCPP	NSPC	TW	SYPP (g)	SYPLOT (g)	BY	HI
				60 DAS	90DAS									
T_0	Control	88.63	77.89	70.89	75.12	4.29	128.67	18.41	6.94	5.98	2.12	48.6	4.56	38.90
T_1	$MnSo_4$ (0.3%)	90.12	73.96	62.11	77.34	5.01	123.96	22.14	7.08	6.88	2.88	71.4	5.23	55.07
T_2	$MnSo_4$ (0.5%)	92.34	76.55	65.35	80.58	5.41	124.16	23.45	7.51	7.06	2.96	73.8	6.69	44.25
T_3	$Feso_4$ (0.3%)	89.14	70.12	72.94	88.17	4.88	120.12	18.46	8.04	8.14	2.69	65.7	5.34	50.37
T_4	$Feso_4$ (0.5%)	93.54	69.35	73.21	89.44	4.98	119.35	19.87	8.28	8.41	2.94	73.2	7.48	39.30
T_5	Pongamia leaf powder (3%)	94.22	76.61	73.83	89.06	5.77	116.56	24.77	8.64	8.77	3.55	81.2	5.78	42.95
T_6	Pongamia leaf powder (5%)	97.48	65.67	77.46	92.69	5.97	115.89	25.91	8.95	9.43	4.78	128.4	8.26	79.53
T_7	Arappu leaf powder (3%)	93.64	72.96	60.91	76.14	4.66	122.96	25.33	8.26	8.16	3.35	85.5	7.78	43.06
T_8	Arappu leaf powder (5%)	94.11	74.65	63.42	78.65	4.84	124.65	25.86	8.46	8.89	3.65	91.5	7.26	42.98
T_9	Notchi leaf powder (3%)	90.89	69.24	58.66	73.89	5.11	119.24	21.54	7.99	7.56	2.98	74.4	7.66	38.90
T_{10}	Notchi leaf powder (5%)	91.49	70.84	61.71	76.94	5.36	120.84	23.55	8.14	8.61	3.19	80.7	7.14	44.68
T_{11}	Kinetin (25ppm)	93.47	74.33	65.43	80.66	5.44	124.33	19.38	8.31	8.36	3.06	76.8	7.31	41.86
T_{12}	Kinetin (50ppm)	95.55	66.56	74.86	90.09	5.59	127.61	24.88	8.74	9.06	3.85	121.5	8.01	78.72
	MEAN	92.82	72.29	66.83	82.06	5.18	122.18	22.27	8.10	8.10	3.27	83.05	6.71	49.86
	MIN	88.63	65.67	70.89	75.12	4.29	115.89	18.41	6.94	5.98	2.12	48.60	4.56	38.90
	MAX	97.48	77.89	77.46	92.69	5.97	128.67	25.91	8.95	9.43	4.78	128.40	8.26	79.53
	C.D @ (5%)	3.26	0.51	4.73	4.17	0.58	0.68	1.85	2.58	4.30	3.13	2.99	3.64	2.04
	SE(d)	1.58	0.25	2.29	2.02	0.28	0.33	0.90	1.25	2.08	1.52	1.45	1.76	0.99
	C.V.	2.60	3.81	7.64	7.64	0.45	3.76	2.64	0.58	0.94	0.69	10.69	1.15	11.25

powder T_6 (5%), followed by (95.55%) kinetin T_{12} 50 (50ppm). Whereas minimum field emergence percent recorded with T_0 control (88.63%).

This experiment provided information that field emergence percent increases when linseed seeds are treated with pongamia leaf powder (5%) when compared with other treatments.

3.2 Days to 50% Flowering

The minimum days to 50% flowering (65.89) recorded with pongamia leaf powder T_6 (5%), followed by T_{12} kinetin (50PPM). The maximum days to 50% flowering recorded with (77.89) T_0 control. This experiment provided information that days to 50% flowering reduced when linseed seeds treated with pongamia leaf powder (5%) in comparison with other treatments.

3.3 Plant Height at 60 DAS

The maximum plant height at 60 DAS (77.46 cm) is recorded with pongamia leaf powder T_6 (5%) followed by (74.86 cm) kinetin T_{12} 50 (ppm). And minimum plant height at 60 days was recorded with T_0 control (70.89cm).

This experiment provided information about plant height at 60 DAS increased when linseed seeds are treated with pongamia leaf powder (5%) in comparison with other treatments.

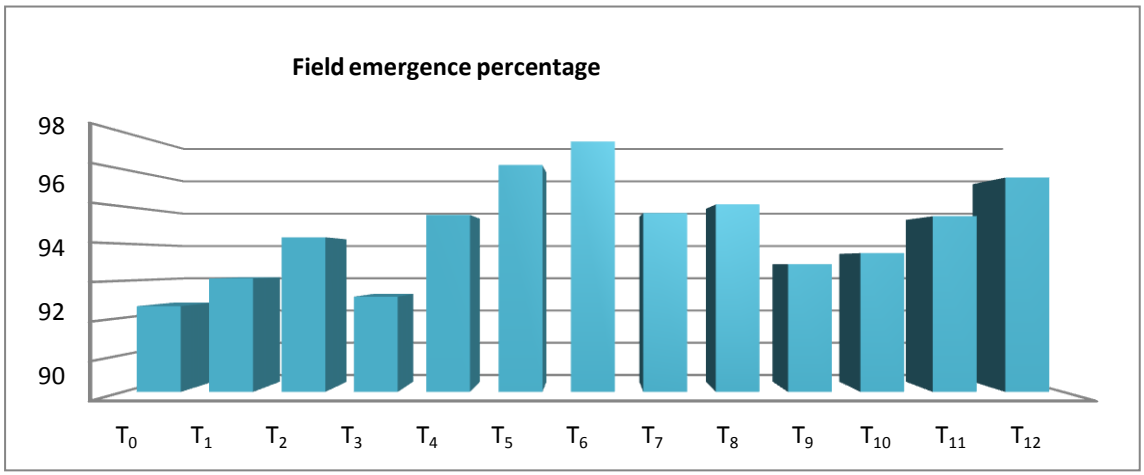

Fig. 1. Field emergence as influence by priming treatments on linseed

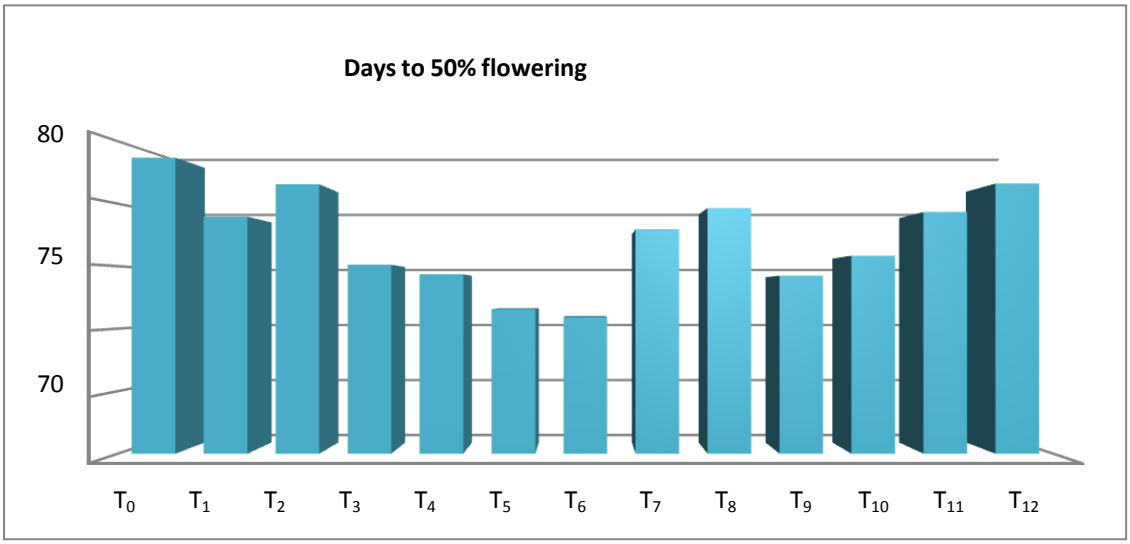

Fig. 2. Days to 50% flowering as influence by priming treatments on linseed

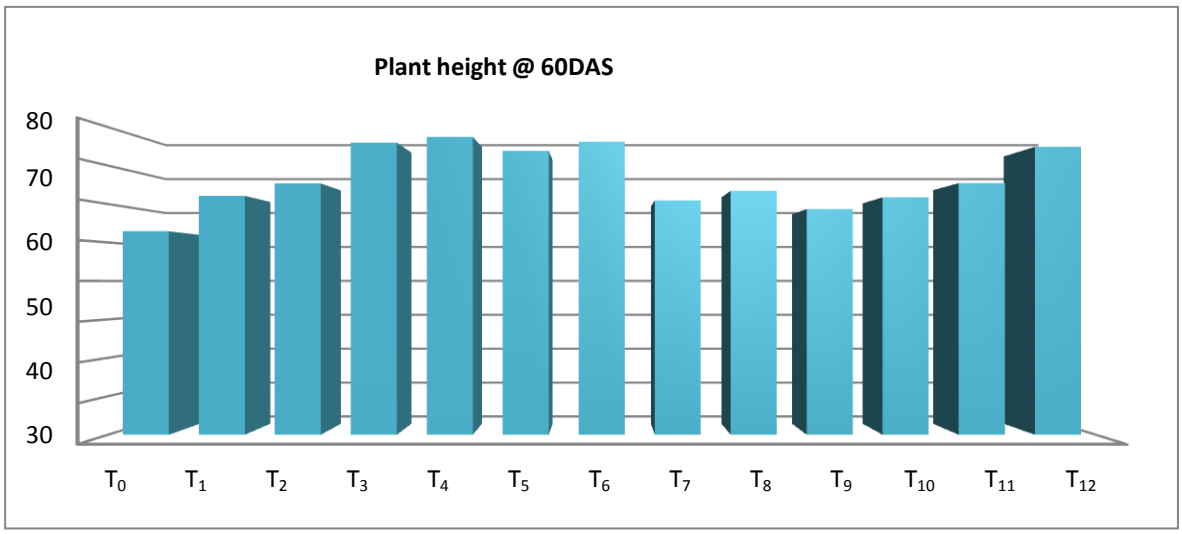

Fig. 3. Plant height at 60 DAS as influence by priming treatments on linseed

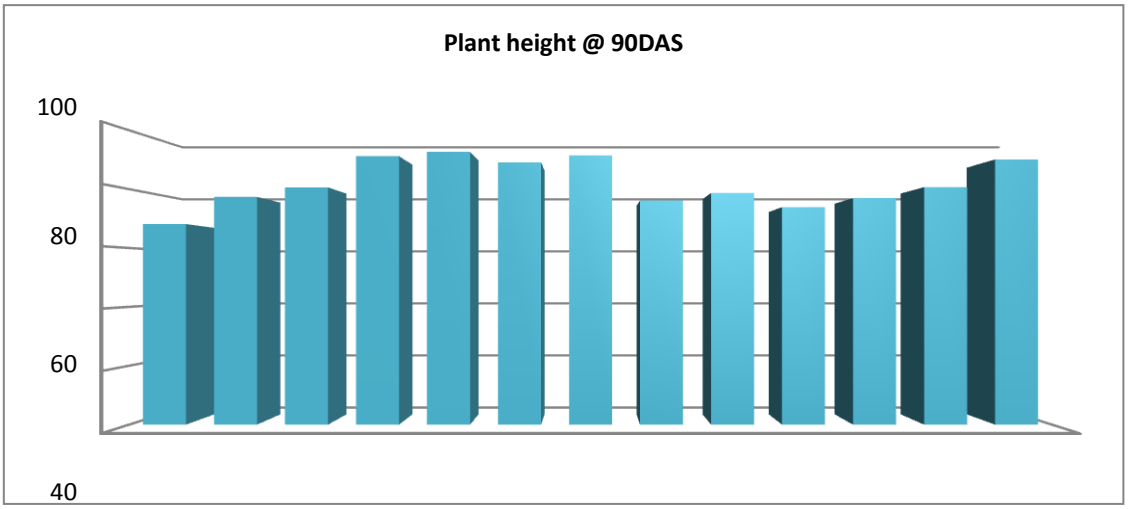

Fig. 4. Plant height at 90 DAS as influence by priming treatments on linseed

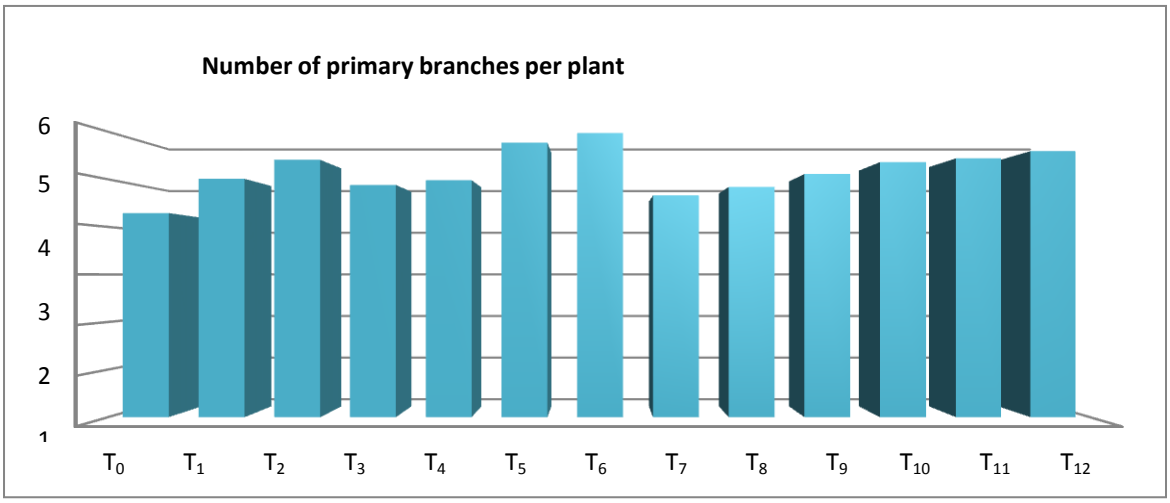

Fig. 5. Number of primary branches per plant as influence by priming treatments onlinseed

3.4 Plant Height at 90 DAS

The maximum plant height at 90 DAS (92.69cm) recorded with pongamia leaf powder T_6 (5%), followed by (90.09cm) kinetin T_{12} (50ppm). Whereas minimum plant height (75.12cm) was recorded with T_0 control. The data collected was statistically analysed and found significant difference among the triats. This experiment provided information that plant height at 90 DAS increased when linseed seeds treated with pongamia leaf powder (5%) in comparison to other treatments.

3.5 Number of Primary Branches per Plant

The maximum number of primary branches per plant (5.97) recorded with pongamia leaf powder T_6 (5%) followed by kinetin T_{12} (50 ppm). And minimum number of primary branches per plant (4.29) was observed in T_0 control. Number of primary branches per plant data was collected and statistically analysed found significant difference among the traits. This experiment provided information that number of primary branches per plant increased when linseed seeds treated with pongamia leaf powder (5%) in comparison with other treatments [14].

3.6 Days to Maturity

The maximum number of days taken to maturity (128.67) recorded with T_0 control followed by (125.61) kinetin T_{12} (50 PPM) and reduced days to maturity to minimum recorded with pongamia leaf powder T_6 (5%). This experiment provided information that Days to maturity decreased when linseed seeds treated with pongamia leaf powder (5%) in comparison with othertreatments.

3.7 Number of Capsules Per Plant

The maximum number of capsules per plant (25.91) recorded with pongamia leaf powder T_6 (5%), followed by (24.84) kinetin T_{12} (50ppm). Whereas minimum number of capsules per plant (18.41). recorded with T_0 control.

This experiment provided information that no of capsules per plant increased when linseed seeds treated with pongamia leaf powder (5%) when compared with other treatments.

3.8 Number of Seeds per Capsule

A range of 6.94 to 8.95 of number of seeds per capsule with 8.10 mean value were obtained. The maximum number of seeds per capsule (8.95) recorded with pongamia leaf powder T_6 (5%), followed by (8.74) kinetin T_{12} (50 PPM). Whereas minimum number of seeds per capsule (6.94) recorded with T_0 control. This experiment provided information that no of seeds per capsule increased when linseed seeds treated with pongamia leaf powder (5%) when compared with other treatments.

3.9 Test Weight

The maximum test weight (9.43g) recorded with pongamia leaf powder T_6 (5%) followed by (9.06g) kinetin T_{12} (50ppm). Whereas minimum test weight was recorded with (5.98) T_0 control. This experiment provided information that test weight increased when linseed seeds are treated with pongamia leaf powder (5%) in comparison with other treatments.

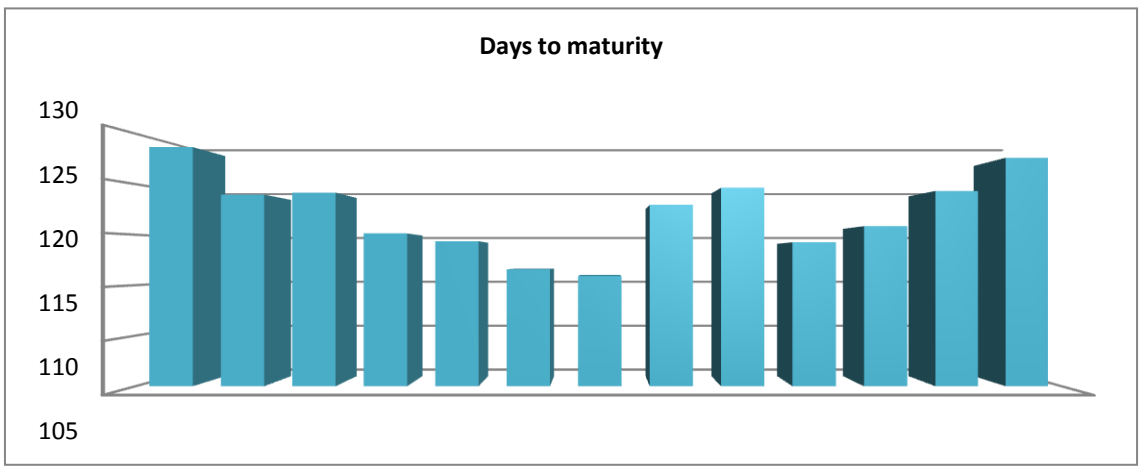

Fig. 6. Days to maturity as influence by priming treatments on linseed

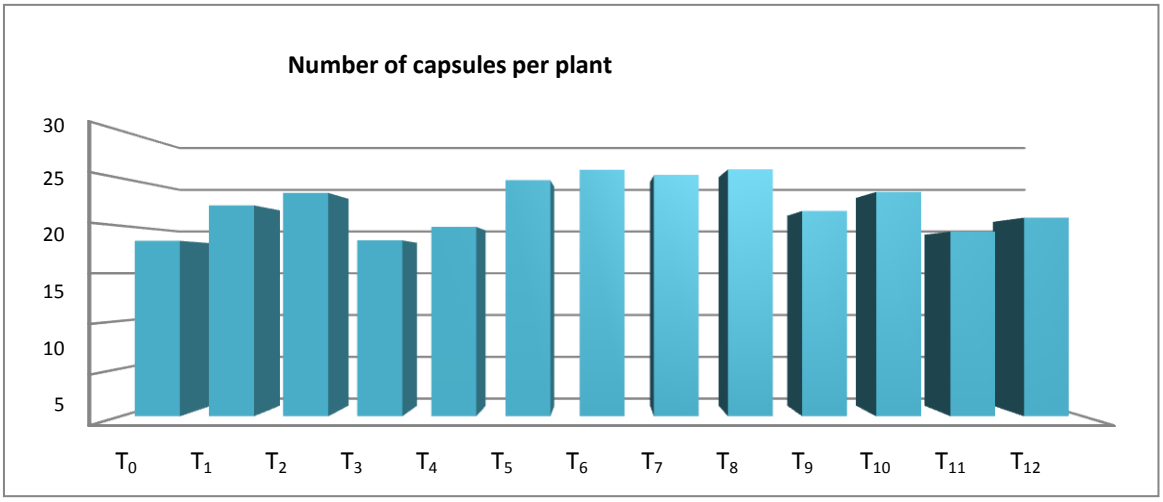

Fig. 7. Number of capsules per plant as influence by priming treatments on linseed

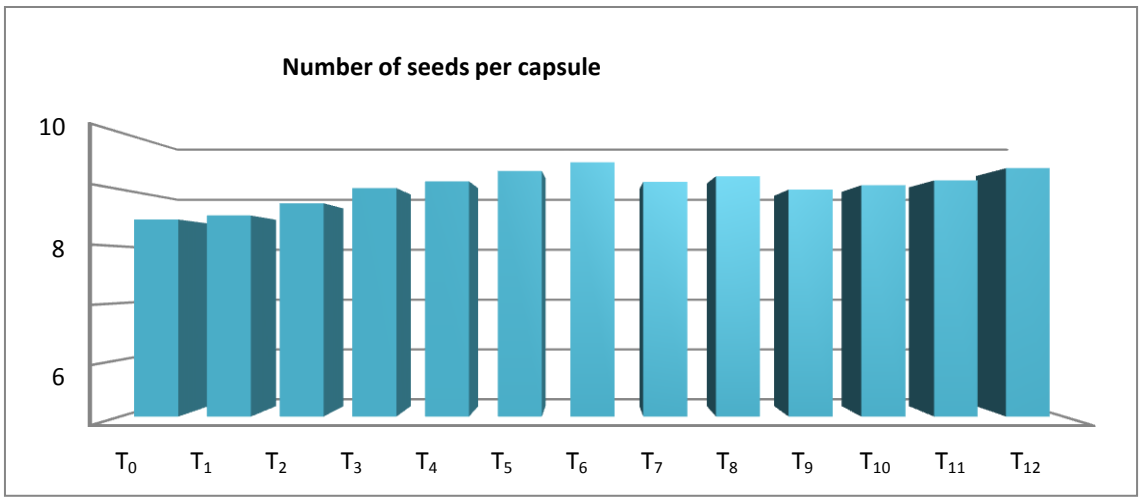

Fig. 8. Number of capsules per plant as influence by priming treatments on linseed

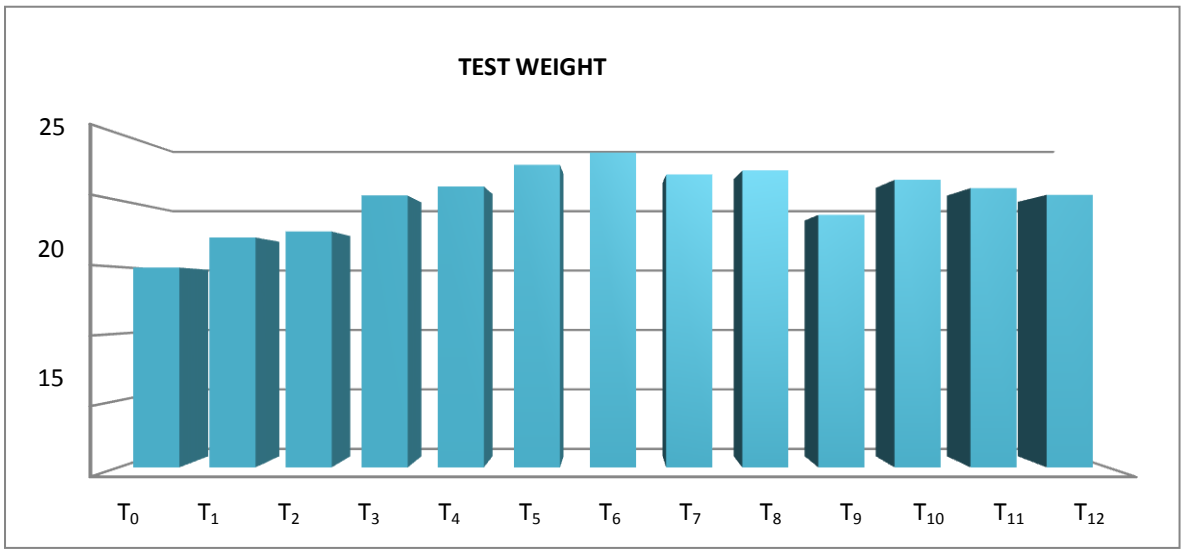

Fig. 9. Test weight as influence by priming treatments on linseed

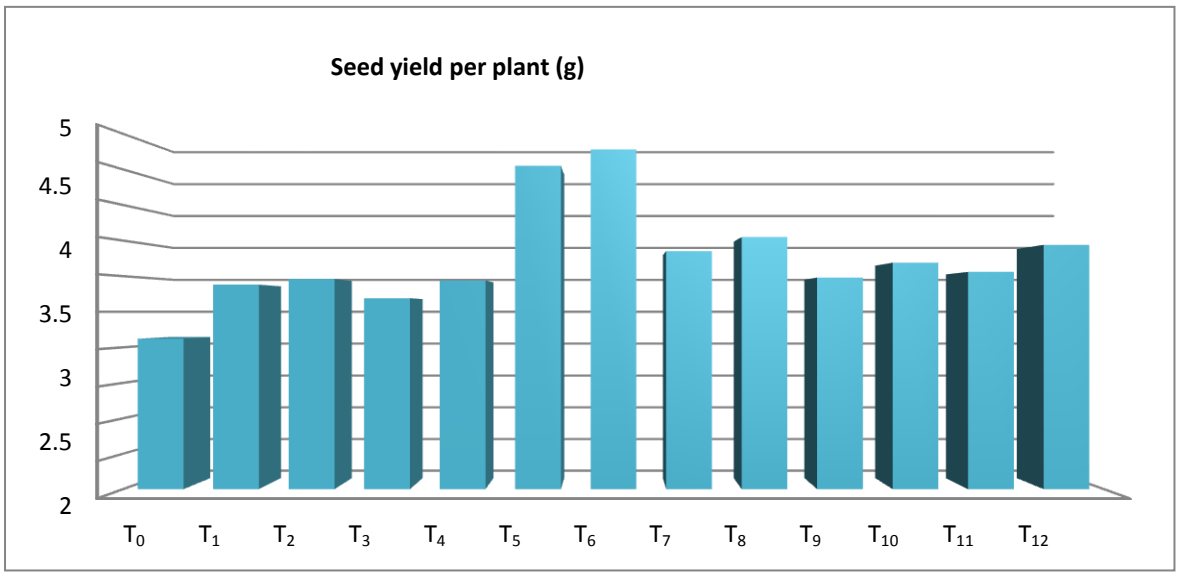

Fig. 10. Seed yield per plant (g) as influence by priming treatments on linseed

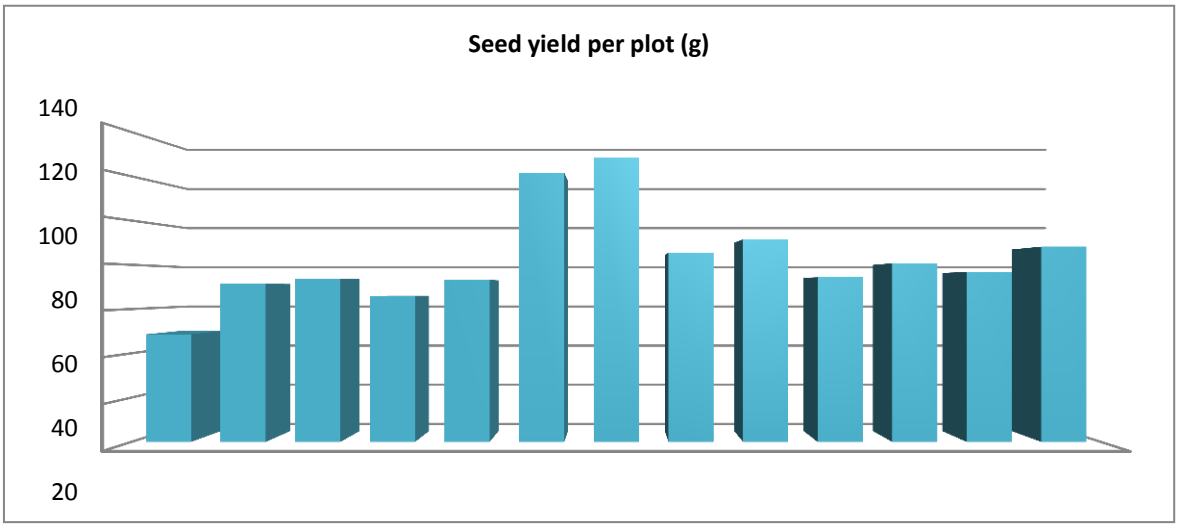

Fig. 11. Seed yield per plot (g) as influence by priming treatments on linseed

3.10 Seed Yield per Plant (g)

The maximum seed yield per plant (4.78g) recorded with pongamia leaf powder T_6 (5%), followed by (3.85g) kinetin T_{12} (50 ppm). Whereas minimum seed yield per plant recorded with (2.12 g) T_0 control. This experiment provided information about seed yield per plant that it increased when linseed seeds treated with pongamia leaf powder (5%) in comparison to other treatments.

3.11 Seed Yield per Plot (g)

The maximum seed yield per plot (128.4g) recorded with pongamia leaf powder T6 (5%), followed by (121.5g) kinetin T_{12} (50ppm). Whereas minimum seed yield per plot recorded with (48.6g) T_0 control This experiment provided information that seed yield per plot increased when linseed seeds are treated with pongamia leaf powder (5%) in comparison with other treatments.

3.12 Biological Yield

The maximum biological yield recorded with (8.26) pongamia leaf powder T_6, followed by Kinetin T_{12} 50 ppm (8.01). Whereas minimum biological yield recorded with (4.56) T_0 control This experiment provided information that biological yield increased when linseed seeds treated with pongamia leaf powder (5%) in comparison with other treatments.

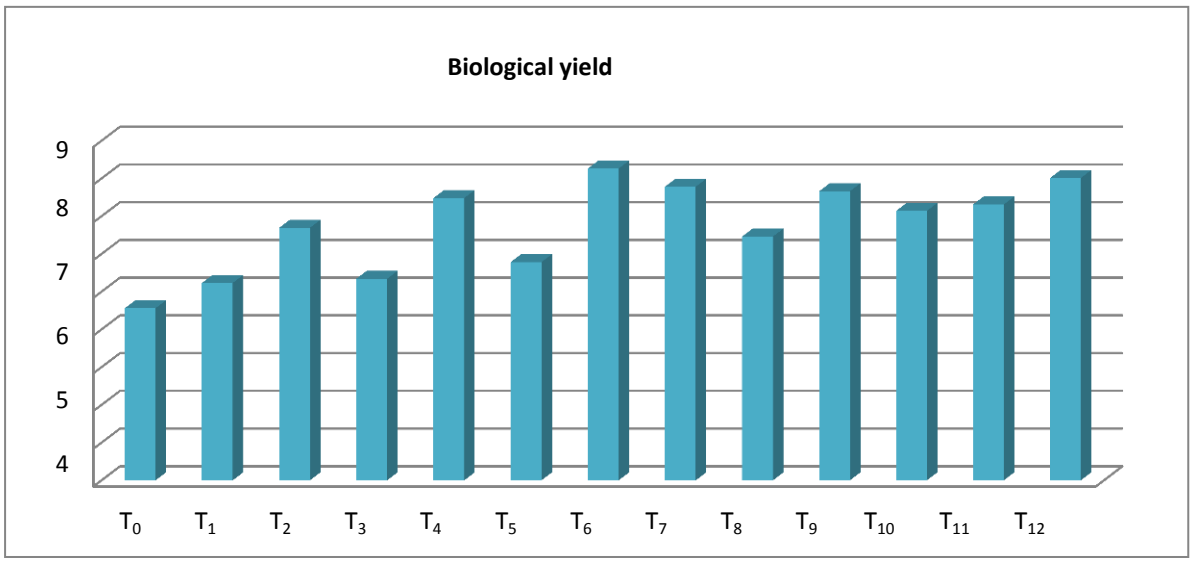

Fig. 12. Biological yield as influence by priming treatments on linseed

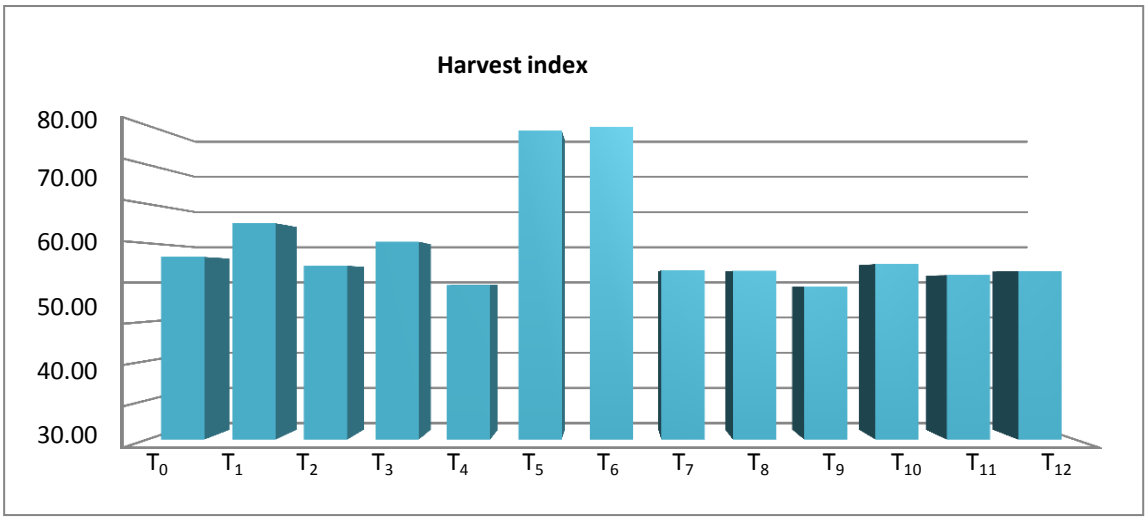

Fig. 13. Harvest index as influence by priming treatments on linseed

3.13 Harvest Index

The maximum harvest index (79.53) recorded with pongamia leaf powder T_6 (5%), followed by (78.72) kinetin T_{12} (50ppm) and minimum harvest index (38.90) recorded with T_0 control. This experiment provided information about harvest index that it increased when linseed seeds are treated with pongamia leaf powder (5%) when compared with other treatments [15].

4. CONCLUSION

It is concluded from the present study that pongamia leaf powder 5% treated with linseed seeds variety Uma can significantly affect growth, yield and yield attributing traits. It resulted in increase in field emergence (97.48%), plant height 60 days (77.46cm) and 90 days (92.69cm) no of primary branches per plant (5.97), no of seeds per capsule (8.95), no of capsules per plant (25.91), test weight (9.43), seed yield per plant (4.78g), seed yield per plot (128.4g), biological yield (8.26), harvest index (79.53). And lower down days to 50% flowering (65.67) and days to maturity (115.89). Followed by kinetin T_{12} (50ppm), in comparison with other treatments T_0 control.

ACKNOWLEDGEMENT

I express my sincere gratitude to all members of Seed science and technology, Department of

Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology and Sciences, Naini, Prayagraj, Uttar Pradesh for providing all the necessary requirements and support for research.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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