

**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**

**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 investigation 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) number of primary branches per plant (5.97), number of seeds per capsule (8.95), test weight (9.43), seed yield per plant (4.78gms), seed yield per plot (128.4gms), 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  $T_0$ .

**Key words:** Arappu leaf powder,  $Feso_4$ , kinetin,  $Mnso_4$ , notchi leaf powder, pongamia leaf

**Introduction**

Linseed (*Linum usitatissimum* L.) is an annual self-pollinated crop with origin in the Middle East or the Indian regions (Vavilov, 1951). 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 (Zohary and Hopf, 1999). 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). (Alukedi *et al.*, (2021). 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 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. (Alemayehu *et al.*,

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2019). 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. 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. (Mavi *et al.*, 2015). 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. Kinetin is effective in increasing germination rate salt tolerance and early seedling growth in the salt tolerant cultivar when compared with hydro priming under salt stress. It helps to improve seed germination and seedling emergence under various stress conditions. It leads to decline in endogenous levels of hormones. It helps in increasing nutrient reserves through increased physiological activities and root proliferation. 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.

## MATERIALS AND METHODS

The experimental material for present investigation comprised of thirteen priming treatments on linseed variety (Uma). The experiment was conducted 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<sub>1</sub> (0.3%) and T<sub>2</sub> (0.5%),  $Feso_4$  T<sub>3</sub> (0.3%) T<sub>4</sub> (0.5%), Pongamia leaf powder T<sub>5</sub> (3%) T<sub>6</sub> (5%), Arappu leaf powder T<sub>7</sub> (3%) T<sub>8</sub> (5%) Notchi leaf powder T<sub>9</sub> (3%) T<sub>10</sub> (5%) Kinetin T<sub>11</sub> (25ppm) and T<sub>12</sub> 50 (ppm) at various concentrations along with distilled water control T<sub>0</sub>. (show how log seeds were shocked in treatments )

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 (gms), biological yield, harvest index, test weight in (gms), seed yield per plant (gms) data were collected from the field. The data was subjected to statistical analysis.

## RESULTS AND DISCUSSION

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

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**Comment [a6]:** *i.e.*

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data which is recorded.

UNDER PEER REVIEW

**Table 1 Mean performance of field parameters of linseed**

Treatments	Chemicals	FM	DFE	PH		NPBPP	DM	NCPP	NSPC	TW	SYPP (g)	SYLOT (g)	BY	HI
				60 DAS	90DAS									
T <sub>0</sub>	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 <sub>1</sub>	MnSo <sub>4</sub> (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 <sub>2</sub>	MnSo <sub>4</sub> (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 <sub>3</sub>	Feso <sub>4</sub> (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 <sub>4</sub>	Feso <sub>4</sub> (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 <sub>5</sub>	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 <sub>6</sub>	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 <sub>7</sub>	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 <sub>8</sub>	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 <sub>9</sub>	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 <sub>10</sub>	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 <sub>11</sub>	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 <sub>12</sub>	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

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### Field emergence percentage

The maximum field emergence percent (97.48%) was recorded with pongamia leaf powder T<sub>6</sub> (5%), followed by (95.55%) kinetin T<sub>12</sub> 50 (50ppm). Where as minimum field emergence percent recorded with T<sub>0</sub> 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. This results showed similar findings of Vakeswaran *et al.*, (2015), Vijay kumar *et al.*, (2013), R Jerlin *et al.*, (2011).

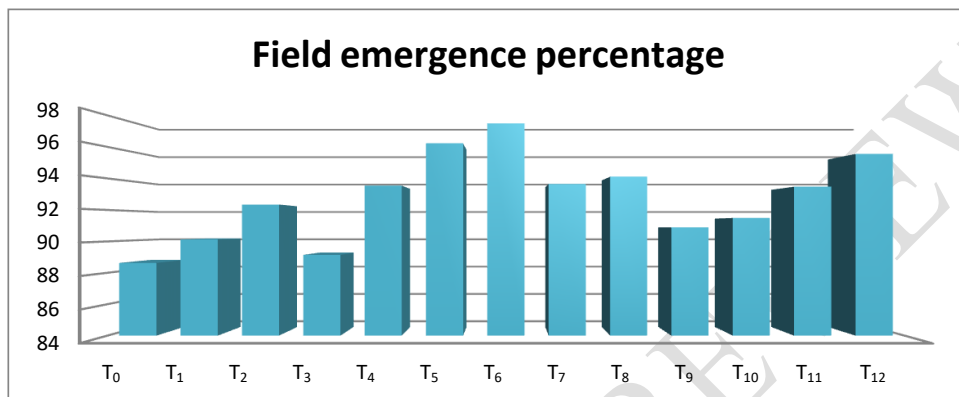


Fig.1 Field emergence as influence by priming treatments on linseed

Comment [a8]: %

### Days to 50% flowering

The minimum days to 50% flowering (65.89) recorded with pongamia leaf powder T<sub>6</sub> (5%), followed by T<sub>12</sub> kinetin (50PPM). The maximum days to 50% flowering recorded with (77.89) T<sub>0</sub> control.

This experiment provided information that days to 50% flowering reduced when linseed seeds treated with pongamia leaf powder (5%) in comparison to other treatments. This results showed similar findings of Prakash *et al.*, (2013), Mavi *et al.*, (2011), Sajjan *et al.*, (2009).

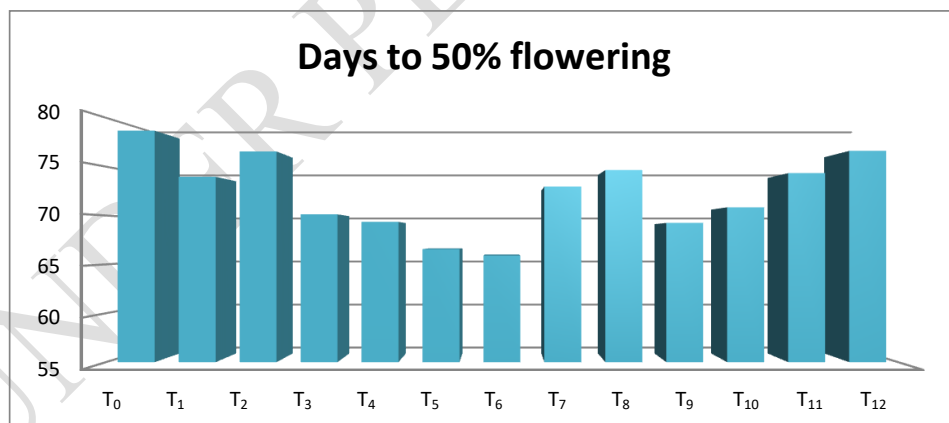


Fig. 2 Days to 50% flowering as influence by priming treatments on linseed

### 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. This results showed similar findings of **Rasool et al., (2019)**, **Tassadduq et al., (2017)**, **Riaz et al., (2015)**.

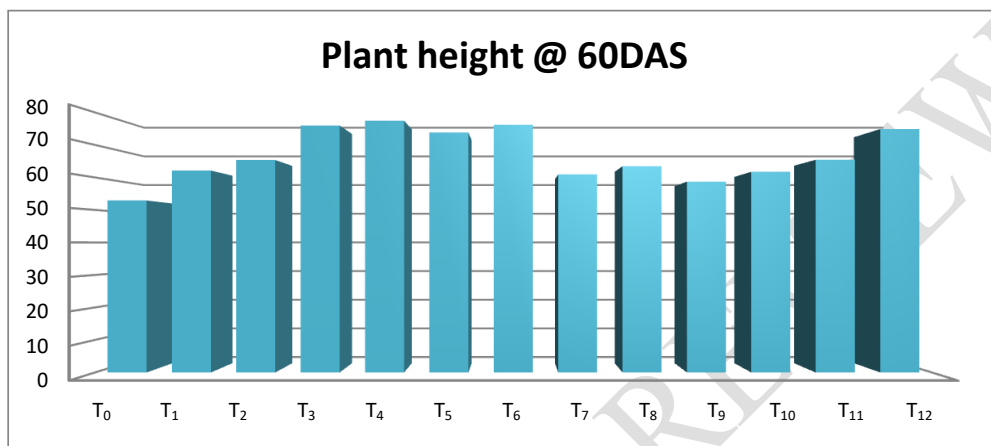


Fig.3 Plant height at 60 DAS as influence by priming treatments on linseed

Comment [a9]: Unit of height

### 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). Where as minimum plant height (75.12cm) was recored 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. This results showed similar findings of **Mondalet et al., (2019)**, **Sananda et al., (2016)**, **Bandana bose et al., (2014)**.

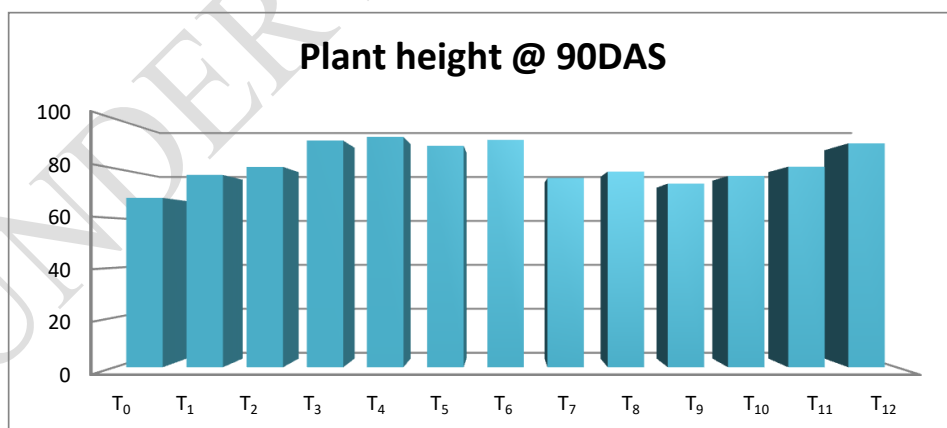


Fig.4 Plant height at 90 DAS as influence by priming treatments on linseed

Comment [a10]: Unit of height

**Number of primary branches per plant**

The maximum number of primary branches per plant (5.97) recorded with pongamia leaf powder T<sub>6</sub> (5%) followed by kinetin T<sub>12</sub> (50 ppm). And minimum number of primary branches per plant (4.29) was observed in T<sub>0</sub> 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. This results showed similar findings of Chormule *et al.*, (2018), SR, NM Changade *et al.*, (2017), JB Patel *et al.*, (2016)

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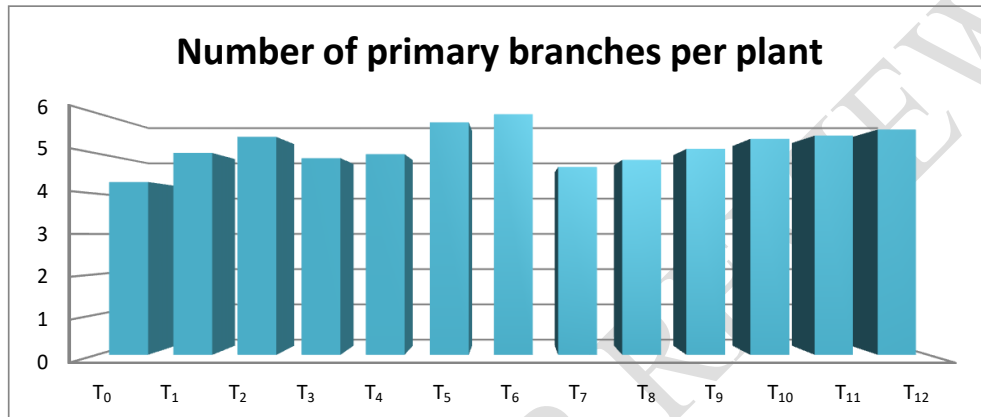


Fig .5 Number of primary branches per plant as influence by priming treatments on linseed

**Days to maturity**

The maximum number of days taken to maturity (128.67) recorded with T<sub>0</sub> control followed by (125.61) kinetin T<sub>12</sub> (50 PPM) and reduced days to maturity to minimum recorded with pongamia leaf powder T<sub>6</sub> (5%).

This experiment provided information that Days to maturity decreased when linseed seeds treated with pongamia leaf powder (5%) in comparison with with other treatments. This results showed similar findings of Umesh *et al.*, (2017), K Bhanuprakash *et al.*, (2016), J Lakshmi *et al.*, (2014).

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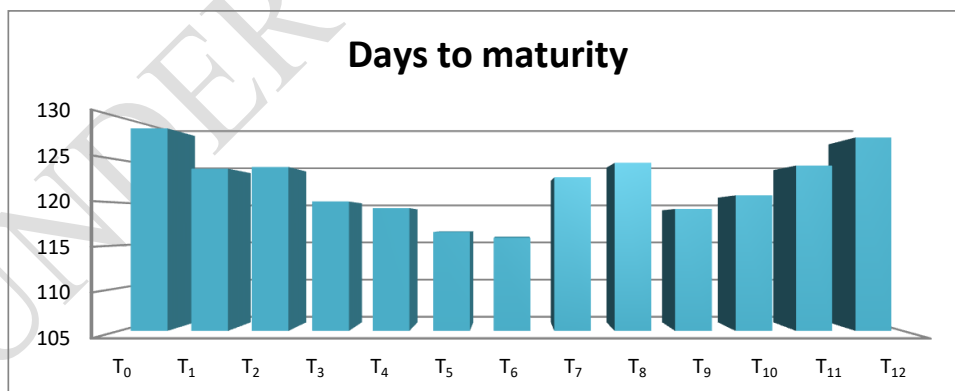


Fig.6 Days to maturity as influence by priming treatments on linseed

### 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). Where as minimum number of capsules per plant (18.41) recorded with  $T_0$  control.

This experiment provided information that number of capsules per plant increased when linseed seeds treated with pongamia leaf powder (5%) when compared with other treatments. This results showed similar findings of **Rehman *et al.*, (2015)**, **H Muhammad *et al.*, (2013)**, **Shahzad Maqsood *et al.*, (2011)**.

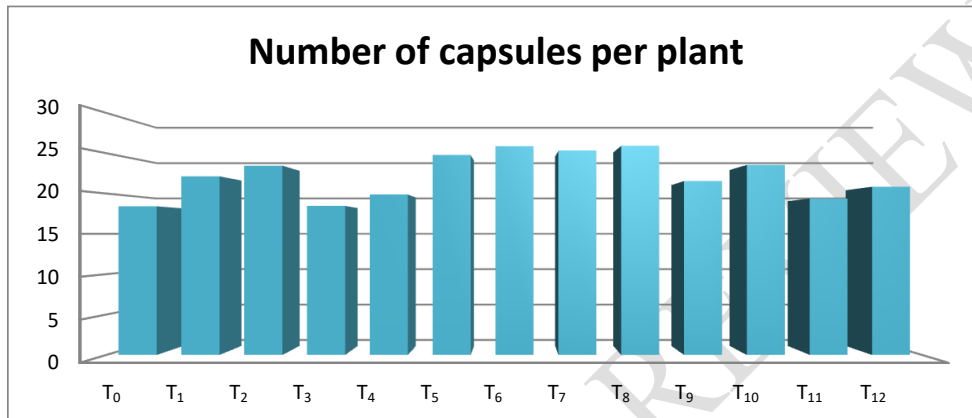


Fig .7 Number of capsules per plant as influence by priming treatments on linseed

### 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). Where as minimum number of seeds per capsule (6.94) recorded with  $T_0$  control.

recorded with  $T_0$  control.

This experiment provided information that number of seeds per capsule increased when linseed seeds treated with pongamia leaf powder (5%) when compared with other treatments.. This results showed similar findings of **Prabha *et al.*, (2016)**, **Deepti *et al.*, (2015)**, **Swati Negi *et al.*, (2014)**.

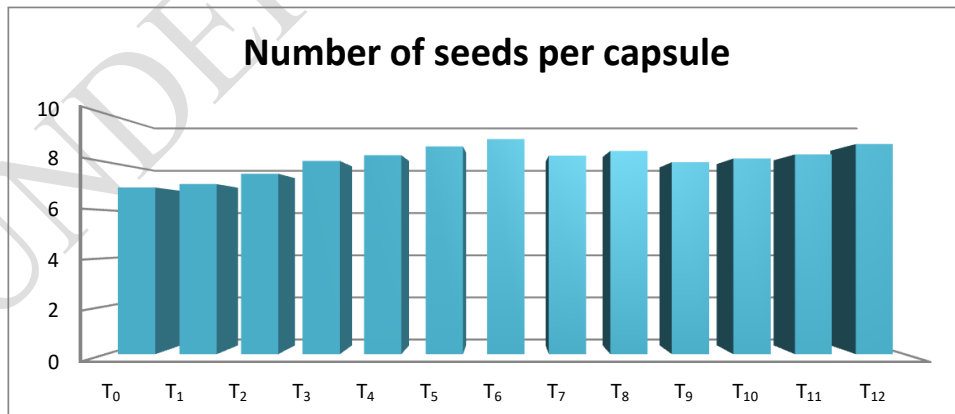


Fig .8 Number of capsules per plant as influence by priming treatments on linseed

### Test weight

The maximum test weight (9.43gms) recorded with pongamia leaf powder  $T_6$  (5%) followed by (9.06gms) 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. This results showed similar findings of **Singh *et al.*, (2015)**, **Harmeet *et al.*, (2010)**, **Rupinder kaul *et al.*, (2009)**.

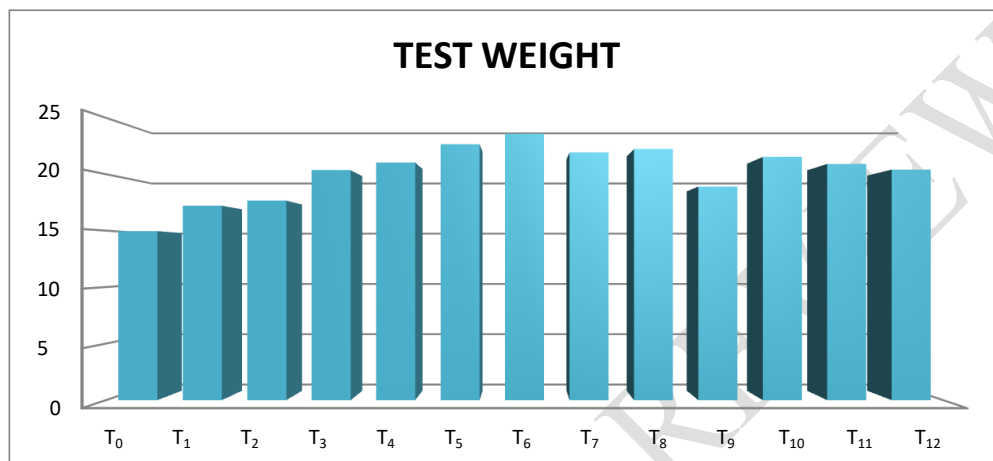


Fig.9 Test weight as influence by priming treatments on linseed

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### Seed yield per plant (gms)

The maximum seed yield per plant (4.78 gms) recorded with pongamia leaf powder  $T_6$  (5%), followed by (3.85gms) kinetin  $T_{12}$  (50 ppm). Whereas minimum seed yield per plant recorded with (2.12 gms)  $T_0$  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. This results showed similar findings of **Umesh *et al.*, (2017)** **Zohary *et al.*, (2015)**, **Ashok *et al.*, (2014)**.

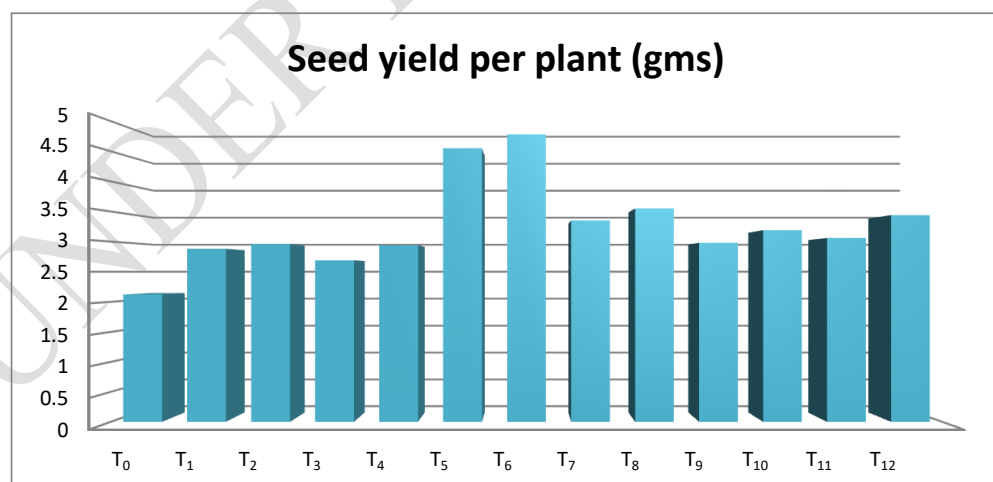


Fig.10 Seed yield per plant (gms) as influence by priming treatments on linseed

Comment [a15]: Unit gm

### Seed yield per plot (gms)

The maximum seed yield per plot (128.4gms) recorded with pongamia leaf powder T<sub>6</sub> (5%), followed by (121.5gms) kinetin T<sub>12</sub> (50ppm). Whereas minimum seed yield per plot recorded with (48.6gms) T<sub>0</sub> 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. This results showed similar findings of *Sajjan et al., (2017)* *SS Sandhu et al.,( 2016)*, *RB Jollu et al., ( 2014)*.

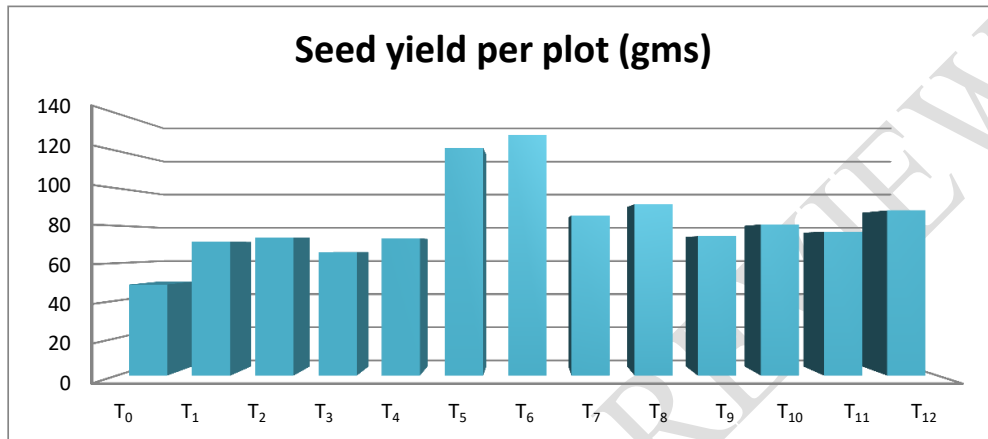


Fig.11 Seed yield per plot (gms) as influence by priming treatments on linseed

### Biological yield

The maximum biological yield recorded with (8.26) pongamia leaf powder T<sub>6</sub>, followed by Kinetin T<sub>12</sub> 50 ppm (8.01). Whereas minimum biological yield recorded with (4.56) T<sub>0</sub> control This experiment

provided information that Biological yield increased when linseed seeds treated with pongamia leaf powder (5%) in comparison with other treatments. This results showed similar findings of *Prabha et al., (2016)*, *Reza et al.,(2014)*,*Rehman et al.,(2012)*.

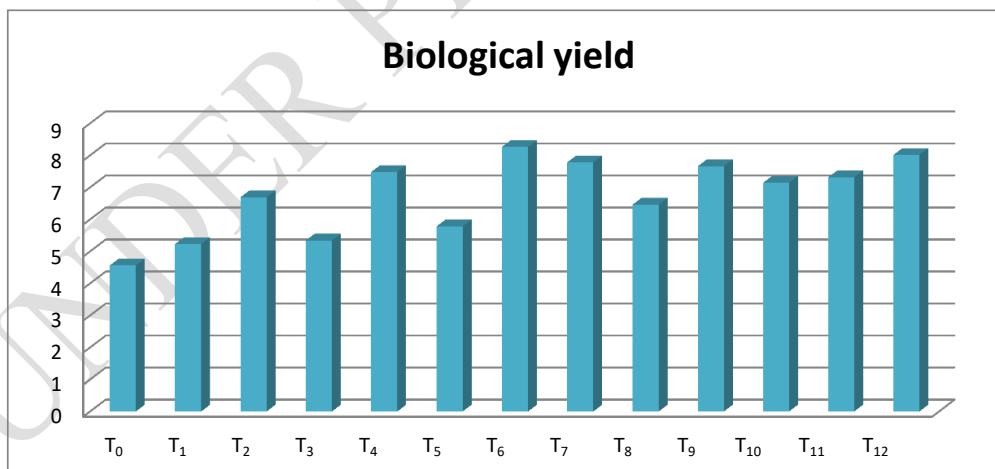


Fig.12 Biological yield as influence by priming treatments on linseed

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### Harvest index

The maximum harvest index (79.53) recorded with pongamia leaf powder T<sub>6</sub> (5%), followed by (78.72) kinetin T<sub>12</sub> (50ppm) and minimum harvest index (38.90) recorded with T<sub>0</sub> 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. This results showed similar findings of Singh *et al.*, (2015), Jassal *et al.*,(2013), Somesh *et al.* , (2012).

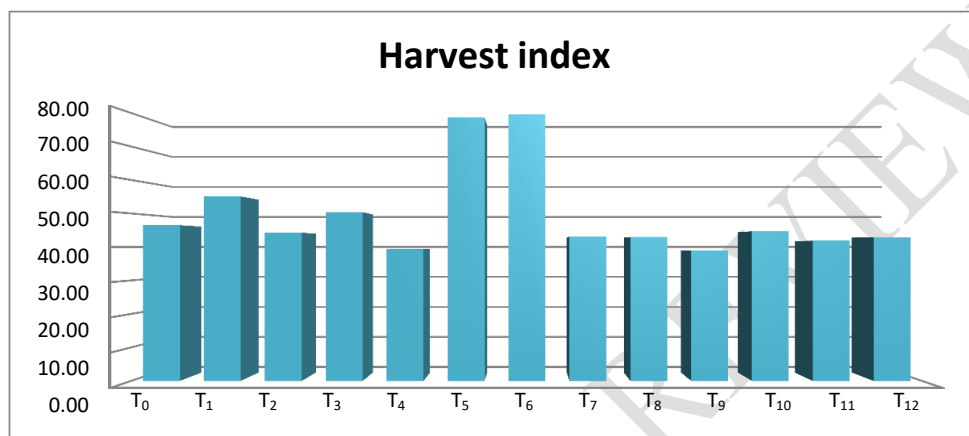


Fig.13 Harvest index as influence by priming treatments on linseed

### CONCLUSION

It is concluded from the present study that pongamia leaf powder 5% treated with linseed seeds variety Uma can significantly effect growth, yield and yield attributing triats. And lower down days to 50% flowering and days to maturity.Followed by kinetin T<sub>12</sub> (50ppm), in comparison with other treatments T<sub>0</sub> control.

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Comment [a17]:

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