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Effect on different date of sowing and application insecticide on growth and yield of mustard crop (*Brassica juncea* L.) under climatic condition Allahabad

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Abstract
Field experiments were concluded at College of forestry, Sam Higginbottom University of Agriculture, Technology & Sciences Allahabad during Rabi season on - 2016 September – 2017 march at that different sowing date and treatment combination viz. 25 October, 04 November,14 November sowing dates. gave best results 25 October for Plant height, Number of branches $^{-1}$, Siliqua plant^{-1} number of flowering 50 % and 100 %, number of siliqua length, seeds siliqua^{-1} test weight of seeds, seed yield q ha^{-1}, with compared 04, November and 14 November respectively. Therefore it is recommended that for good growth and yield of Mustard (Parasmani-8 variety) to the grower under Uttar Pradesh climatic condition.

Keywords: sowing, plant growth, cultivation, insecticide yield

Introduction
Brassica spp. belongs to the family Brassicaceae (Cruciferae) Rapeseed and mustard are the third most important edible oilseed crops of the world after soybean and oil palm. These crops are grown under a wide range of agro-climatic conditions. Indian mustard is the most important member of the group, accounting for more than 70 percent of the area under rapeseed-mustard. The crop distribution in different states of India is Assam, Orissa, W.B, Meghalaya, Tripura, Haryana, H.P, U.P, Jammu, M.P, and Rajasthan. But the major Mustard growing states are Haryana, Rajasthan U.P, M.P, and representing 81 percent of the total mustard and Rai seed production. (Anonymous, 2015) [2] Mustard is rich in minerals like calcium, magnesium, iron, vitamin A, C and proteins. 100 g mustard seed contains 508 kcal energy, 28.09 g carbohydrates, 26.08 g proteins, 36.24 g total fat, 12.2 g dietary fiber, 31 I.U. vitamin A, 7.1 mg vitamin C, 266 mg calcium, 9.21 mg iron, 370 mg magnesium and 738 mg potassium. Mustard aphid, *Lipaphis erysimi* (Kalt.) is one of the most serious pest and is considered to be the limiting factor in the successful cultivation of rapeseed-mustard. The colonies of mustard aphids feed on the new shoots, inflorescence and underside of leaves. loss in yield up to 91.3 percent (Singh and Sachan, 1994) [4]. It is therefore, essential to keep this pest under control so as to reap profitable harvest. To control this pest, different insecticides have been evaluated and recommended by many workers like However, in the present studies some new insecticides have been evaluated along with the already recommended insecticides for the control of mustard aphid. Malathion 50 EC (0.05%), chloropyriphos 20 EC (0.05%), dimethoate 30 EC (0.O3%), cypermethrin 10 EC (0.01%), endosulfan 35 EC (0.07%), imadacloprid 17.8 SL (0.0178%), neemarin 0.03% (1 ml/ l) and an untreated check. Choudhury and Pal (2005) [3].

Materials and Methods
The experiment was carried out in field of Nursery college of Forestry, Sam Higginbottom University of Agriculture Technology & Sciences, Allahabad (U.P)., during Rabi season (2016-2017). Allahabad is located in the south-East part of Utter Pradesh India. The site of experimental site (research and nursery area) situated 25.45° N 81.85° E and at an altitude of 98 meter above sea level. All the required materials and facilities necessary for the cultivation

readily in the department. This region has a subtropical climate with extreme of summer and winter. These locations receive the mean annual rainfall ranges from 500 mm to 1500 mm. More than 70 per cent rains are received during S-W monsoon season 5 to 10 per cent rains are received in winter, 10-15 per cent in summer and 5-10 per cent during post monsoon season. Temperatures vary greatly in these regions. may June are the hottest and December and January are the coldest. Monthly mean temperature more than 25 ^{0}C prevails during 8-10 ^{0}C frost for one or two days may also occur during winter months. The weekly average data on weather condition during the experimentation period was recorded at meteorological observatory location at the research and nursery area of the college of forestry an, SHUATS, Allahabad (U.P.) Pre-sowing operations the field was prepares by ploughing with a tractor drawn disc plough two times, followed by cross harrowing and planking. The field was thoroughly leveled by a scrapper before it was laid out. The weeds were picked up in order to get a clean field, after that lay out of the field was made according to plan of layout. Fertilizer application The basal dose of fertilizer at a rate of 40 kgha^{-1} N as urea, phosphorus and potash 60 kgha^{-1}, 40 kgha^{-1} through DAP and MOP and 20 kgha^{-1} S as gypsum was applied as a basal dose applied sowing tome treatment according to plan of layout Fertilizer were applied in nitrogen ½ half dose sowing time. Sowing of seed the Mustard variety used was Parasamani-8 Seed were sown at a depth of 2.5 to 5.0 cm in rows with a seed rate of 4-5 kg ha^{-1}.The rows were 30 cm apart. Post-sowing operations Gap filling Seed germinations was observed at five days of sowing. Which continued up to 6th day, Seeds were re- sown in the gaps where the previous seeds failed to germinate. Thinning of plant was done at 25th day after sowing when the crop developed 6 to 7 leaves/plant. This was done to maintain spacing of 15 cm between plants in a row as per treatment the optimum population in order to avoid overcrowding of the plants. Weeding one hand weeding was done by laboures with khurpi at 15 day after sowing, followed by second manual weeding at 30 days after sowing. This was done to control grassy as well as broad leaf weeds. Irrigation Two irrigation was given during the crop growth period at 20 & 40 days after sowing by flood method of irrigation. Fertilizer application (Top dressing) The dressing was done with the remaining half dose of nitrogen as urea at 40 days after sowing. Urea was applied by furrow placement method at a distance of 10 cm from the crop rows. Harvesting and Threshing the crop was harvested plot wise at maturity stage the siliqua turned brown yellow, 135- 140 days after sowing. Harvesting was done manually by sickless. After completed sun drying the bundles of harvested produce of each plot. The weather data were collected from the Meteorological observatory, SHIATS, Allahabad during the experimental period (Table.2). The experiment was carried out in a factorial design laid out as a randomized block design with three replications. The experiment has two factors (1) Date of sowing D_1-1st sowing date 25th October, D_2-2nd sowing date 04 November, D_3-3rd sowing date 14 November, (2) insecticides C_0- Control, C_1-Chlorpyrifos 20 % EC @(150 ml/ha, C_2 -Imidacloprid 200 SC@(300 ml/ha.

The observations were recorded on five randomly selected competitive plants in each treatment and replication for all the characters were recorded on plot basis. Five plants from each plot were randomly selected and tagged for recording a representative sample of the entire population. Pre-harvest observations i.e. Plant height (cm) at different growing stages viz., 80,100 and 120 Days after sowing (DAS), Number of Branches Plant^{-1} at 80,100and 120 DAS, Silique plant^{-1} 80,100 and 120 Days after sowing (DAS), Number of flowering at 50 and 100 percentage, Length of silique and Post-harvest observations i.e. Number of seed per silique, Test weight (g) and yield (q ha^{-1}) were recorded.

Table 1: Treatment combination of the experimental plan

Treatment	Treatment combination	Code
T_1	1st Sowing Date / Control	D_1C_0
T_2	1st sowing date / Chlorpyrifos	D_1C_1
T_3	1st sowing date / Imidacloprid	D_1C_2
T_4	2nd sowing date / control	D_2C_0
T_5	2nd sowing date / Chlorpyrifos	D_2C_1
T_6	2nd sowing date / Imidacloprid	D_2C_2
T_7	3rd sowing date / Control	D_3C_0
T_8	3rd sowing date / Chlorpyrifos	D_3C_1
T_9	3rd sowing date / Imidacloprid	D_3C_2

Table 2: Effect of sowing date and application of insecticides on Plant height (cm) after 80,100,120 DAS.

Levels of Date (D)	80 DAS				100 DAS				120 DAS			
	Levels of insecticides (C)			Mean (D)	Levels of insecticides (C)			Mean (D)	Levels of insecticides (C)			Mean (D)
	C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid		C_0= Control	C_1= Chlorpyriphos	C_2= Imidacloprid		C_0= Control	C_1= Chlorpyriphos	C_2= Imidacloprid	
25-Oct	95.40	112.30	112.03	106.58	131.40	157.10	146.57	145.02	148.23	184.80	181.13	171.39
4- Nov	91.10	110.13	107.43	102.89	126.63	152.57	143.67	140.96	144.57	175.87	171.47	163.97
14-Nov	91.10	107.87	103.43	100.80	124.07	152.20	142.23	139.50	143.33	174.43	170.30	162.69
Mean (C)	92.53	110.10	107.63		127.37	153.96	144.16		145.38	178.37	174.30	
	F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%	
Insecticides (C)	S	1.343	2.847		S	0.686	1.455		S	0.546	1.158	
Date (D)	S	1.343	2.847		S	0.686	1.455		S	0.546	1.158	
Inter (CxD)	NS	2.326	4.931		NS	1.188	2.519		S	0.946	2.005	

Table 3: Effect of sowing date and application of insecticides on branch plant^{-1} after 80,100,120 DAS.

Levels of Date (D)	80 DAS				100 DAS				120 DAS			
	Levels of insecticides (C)			Mean (D)	Levels of insecticides (C)			Mean (D)	Levels of insecticides (C)			Mean (C)
	C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid		C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid		C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid	
25-Oct	2.87	4.40	3.93	3.73	4.73	6.13	5.33	5.40	5.60	7.33	5.80	6.24
4- Nov	2.20	2.53	2.13	2.29	3.73	4.93	3.80	4.16	5.00	6.67	5.13	5.60
14-Nov	2.13	3.40	2.20	2.58	3.27	4.00	3.07	3.44	4.20	5.67	4.40	4.76

Mean (C)	2.40	3.44	2.76		3.91	5.02	4.07		4.93	6.56	5.11	
	F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%	
insecticides (C)	S	0.142	0.302		S	0.226	0.479		S	0.190	0.403	
Date (D)	S	0.142	0.302		S	0.226	0.479		S	0.190	0.403	
Inter (CxD)	S	0.246	0.522		NS	0.392	0.830		NS	0.329	0.698	

Table 4: Effect of sowing dates and application of insecticides on Siliqua plant^{-1} after 80,100,120 DAS

80 DAS					100 DAS				120 DAS			
Levels of Date (D)	Levels of insecticides (C)			Mean (D)	Levels of insecticides (C)			Mean (D)	Levels of insecticides (C)			Mean (D)
	C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid		C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid		C_0= Control	C_1= Chlorpyrifos	C_2= Imidacloprid	
25-Oct	60.24	80.48	73.60	71.44	90.63	119.33	117.38	109.12	123.37	144.80	141.11	136.43
4- Nov	54.10	67.15	52.75	58.00	82.20	101.90	85.21	89.77	118.73	142.62	138.90	133.42
14-Nov	53.10	69.07	54.27	58.81	84.33	89.27	78.53	84.04	107.17	121.20	112.67	113.68
Mean (C)	55.81	72.23	60.21		85.72	103.50	93.71		116.42	136.21	130.89	
	F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%		F-test	S. Em. (±)	C.D. at 5%	
insecticides (C)	S	1.224	2.594		S	2.324	4.926		S	1.063	2.253	
Date (D)	S	1.224	2.594		S	2.324	4.926		S	1.063	2.253	
Inter(CxD)	S	2.119	4.493		S	4.025	8.533		S	1.840	3.902	

Table 5: Effect of sowing dates and application of insecticides on flowering 50 Percent And 100 Percent.

	50 Percent				100% Percent			
	Insecticides (C)				Insecticides (C)			
Levals of Date (D)	C_0 = Control	C_1 = Chlorpyrifos	C_1= Imidacloprid	MEAN (D)	C_0 = Control	C_1 = Chlorpyrifos	C_1= Imidacloprid	MEAN (D)
25 Oct	12.13	15.00	13.33	13.49	12.13	15.00	13.33	13.49
4- Nov	11.90	14.87	11.40	12.72	11.90	14.87	11.40	12.72
14- Nov	12.13	14.00	13.13	13.09	12.13	14.00	13.13	13.09
Mean (C)	12.06	14.62	12.62		12.06	14.62	12.62	
	F-test	S. Em. (±)	C.D.at 5%		F-test	S. Em. (±)	C.D.at 5%	
Insecticides (C)	S	0.261	0.553		S	0.261	0.553	
Date	S	0.261	0.553		S	0.261	0.553	
Inter (CXD)	S	0.452	0.957		S	0.452	0.957	

Table 6: Effect of sowing dates and application of insecticides on siliqua length plant^{-1}(cm.).

	Siliqua length per plant			
	Incecticides (C)			
Levals of Date (D)	C_0 = Control	C_1 = Chlorpyrifos	C_1= Imidacloprid	MEAN (D)
25 Oct	5.68	6.79	6.63	6.37
4- Nov	5.95	7.43	5.74	6.38
14- Nov	6.09	7.03	6.31	6.47
Mean (C)	5.91	7.08	6.23	
	F-test	S. Em. (±)	C.D.at 5%	
Insecticides (C)	NS	0.167	0.353	
Date	S	0.167	0.353	
Inter (CXD)	S	0289	0.612	

Table 7: Effect of sowing dates and application of insecticides on seeds siliqua^{-1}.

	Seeds Per Siliqua			
	Insecticides (C)			
Levals of Date (D)	C_0 = Control	C_1 = Chlorpyrifos	C_1= Imidacloprid	MEAN (D)
25 Oct	12.13	15.00	13.33	13.49
4- Nov	11.90	14.87	11.40	12.72
14- Nov	12.13	14.00	13.13	13.09
Mean (C)	12.06	14.62	12.62	
	F-test	S. Em. (±)	C.D.at 5%	
Insecticides (C)	S	0.261	0.553	
Date	S	0.261	0.553	
Inter (CXD)	S	0.452	0.957	

Table 8: Effect of sowing dates and application of insecticides on test weight (g).

	Test weight per treatment			
	Insecticides (C)			
Levals of Date (D)	C_0 = Control	C_1 = Chlorpyrifos	C_1= Imidacloprid	MEAN (D)
25 Oct	4.54	5.31	4.81	4.89
4- Nov	4.11	4.91	4.45	4.49

14- Nov	4.03	4.79	4.57	4.46
Mean (C)	4.23	5.00	4.61	
	F-test	S. Em. (±)	C.D.at 5%	
Insecticides (C)	S	0.087	0.185	
Date	S	0.087	0.185	
Inter (CXD)	NS	0.151		

Table 9: Effect of sowing dates and application of insecticides on seeds yield (q ha^{-1}).

	Yield Per Treatment			
	Insecticides (C)			
Levals of Date (D)	**C_0 = Control**	**C_1 = Chlorpyrifos**	**C_1= Imidacloprid**	**MEAN (D)**
25 Oct	10.54	15.17	14.03	13.25
4- Nov	9.21	12.23	10.50	10.64
14- Nov	6.90	11.30	9.71	9.30
Mean (C)	8.88	12.90	11.41	
	F-test	S. Em. (±)	C.D.at 5%	
Insecticides (C)	S	0.233	0.493	
Date	S	0.233	0.493	
Inter (CXD)	S	0.403	0.854	

Results and Discussion

The data of plant height (cm) presented in the table 3 reveal that At 80 days plant height significantly differences were found plant height of mustard due to different sowing dates. The maximum plant height (112.30cm) was recorded from T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) whereas, the minimum was observed for T_0 (2nd DOS 04 November/control) At 100 days maximum plant height (157.10 cm) was recorded for T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) whereas, the minimum plant height (124.07 cm) was observed for T_0 (3rd DOS 14 November/control). At 120 days maximum plant height (184.80cm) was recorded from T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) whereas, the minimum plant height (143.33 cm) was observed for T_0 (3rdDOS 14 November/control).Plant height was highest in early sowing date after plant height decreased in late sowing dates. The plant height were significantly effected in the sowing date and interaction in insecticides on first sowing date (25 October 2016) recorded significantly maximum plant height (184.80cm) as compared second and third DAS with 175.87 and 174.43 cm respectively. The data of the number of branches per plant presented in table 4 the clearly shows At 80 days branches Significantly variations were observed among different sowing date. That the number of branches plant^{-1}. The highest was observed with (4.40) that was recorded at in T_1 (1st DOS 25 October/Chlorpyrifos 20 EC) The lowest (2.13) were recorded in T_0 (3rd DOS 14 November/control). At 100 days that highest were observed in (6.13) that was recorded at in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) the lowest (3.7) was recorded at T_2 (3rd DOS 14 November/Imidacloprid). At 120 days it was the highest was observed with by (7.33) that were recorded at in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) The lowest (4.20) was recorded at T_0 (3rd DOS 14 November/control). The branches per plant was significant effect in the different sowing date and interaction in insecticide first sowing on 25 October 2016 recorded significantly maximum branches plant^{-1} (7.33) as compared second and third DOS with 6.67 and 5.67 respectively. The data of percentage of sillique plant^{1} presented in table 5 reveal that at 80 days sillique plant^{1} significantly variations were observed among different sowing date. The highest was observed with by (80.48) that were recorded at in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) the lowest total siliquae (53.10) was recorded at T_o (3rd DOS 14 November/control). At 100 days the no.of siliquae plant^{-1}. The highest was observed in (119.33) that was recorded in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC). The lowest total siliquae (84.33) was recorded at T_0 (3rd DOS 14 November/control). At 120 days The highest was observed with by (144.80) that was recorded at in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC). The lowest total siliquae (107.17) was recorded at T_0 (3rd DOS 14 November/control) The data of percentage of flowering presented in table 6 reveal clearly shows that Significantly variations were observed among different sowing date that the 50% no. of flowering plant^{-1} The highest was observed with by (58.87) that was recorded at in T_1 (3rd DOS 14 November/ Chlorpyrifos 20 EC). and The lowest of flowering plant^{-1} (41.83) was recorded at T_0 (2nd DOS 04 November/control).That the100% no. of flowering per plant with the age of plants of mustard on number of flowering per plant The highest was observed with by (25.89) that was recorded at in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC). and The lowest of flowering plant^{-1} (18.40) was recorded at T_0 (2nd DOS 04 November/control). The data of the length of silique^{-1}(cm). Significantly variations were observed among different sowing date (Table 7. clearly shows that the no. of siliquae plant^{-1} The highest was observed with by (7.43 cm) was recorded from T_1 (2nd DOS 04 November/Chlorpyrifos 20 EC) whereas, the minimum (5.68 cm) was recorded from at T_0 (1st DOS 25 October/control). The data number of seeds siliqua^{-1} of mustard at maturity significantly due to different sowing date (Table 8 clearly shows that the highest seeds siliquae^{-1} (15.00) was recorded from T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC the lowest seeds siliquae^{-1} (11.40) was found T_2 (Second date of sowing /Imidacloprid). The data Test weight of seed data presented in Table 9 clearly shows that the Test weight of 1000 seeds (g). The test weight of seeds showed a significant the maximum seed weight of seed (5.31 g) was recorded in T_1 (1st DOS/ Chlorpyrifos) and minimum was recorded in treatment (third date /control) with 4.03g. The data of seed yield (q ha^{-1}) presented in Table 10 clearly shows that. The highest yield (606.67 g) was observed in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC) The lowest yield (276.0 g) was recorded at T_o (3rd DOS 14 November/control).Different sowing date of mustard on yield q ha^{-1} The highest yield (15.17q ha^{-1}) was observed in T_1 (1st DOS 25 October/ Chlorpyrifos 20 EC).The lowest yield (6.90 q ha^{-1}) T_0 (3rd DOS 14 November/control).

Conclusion

As far as the Economic feasibility is concluded the treatment T_1 (1st date of sowing 25th October) provides net profit of Rs.26352.00 ha^{-1} with benefit cost ratio is 1:1.93 but the net loss of Rs. 1610. 00 ha^{-1} was recorded in the T_0 (3rd date of sowing /control) treatment with cost benefit ratio is 1:0.96 respectively. T_1 (1st DOS 25th October) gave best results for seed yield (15.17 q ha^{-1}) followed by 4th November (12.23 q ha^{-1}) and 14th November (11.30 qha^{-1}). Therefore it is recommended that for good growth and yield of Mustard (Parasmani-8 variety) to the grower under Uttar Pradesh climatic condition.

References

1. Anonymous. United State Department of Agriculture, 2013-14.
2. Anonymous. Ministry of Agricultural, Government of India, 2015.
3. Choudhury S, Pal S. Efficacy of some newer insecticides against mustard aphid, *Lipaphis erysimi* Kalt. Shashpa. 2005; 12(2):125-126.
4. Singh CP, Sachan GC. Assessment of yield losses in yellow sarson due to mustard aphid, *Lipaphis erysimi* (Kaltenbach). Journal of Oilseed Research. 1994; 11:179-184.