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Effect of variable weather condition on the population dynamic of mustard aphid

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Abstract
Mustard is a major oilseed crop grown during *rabi* season. Weather variability causes substantial fluctuations in any crop production a field experiment was conducted during *Rabi season* of 2015-16 on the topic entitled "Effect of variable weather condition on the population dynamic of mustard aphid" in sandy loam soil of N.D. University of Agriculture and Technology, Kumarganj, Faizabad (U.P.). The experimental comprised of three growing environments *viz*., 15th, October, 30th, October, 14th, November and three cultivars *viz*., NDR-8501, Varuna and Vardan. Results revealed that growing environments of 15th, October produced significantly higher growth yield attributes and yield due to fulfilment of optimum Accumulation heat unit requirement and solar radiation interception requirement for various plant processes. The number of siliquae plant^{-1} number of seed siliqua^{-1} in growing environment14th, November reduced which ultimately resulted the lowest seed yield.

Keywords: Weather, mustard aphid

Introduction
Mustard is a major oilseed crop grown during rabi season. Weather variability causes substantial fluctuations in any crop production. in first sown crop might be attributed to comparatively lower aphid population during crop growth and maximum time taken by the crop for its growth and development (Verma *et al*, 1993) [9]. From field studies conducted (Rohilla, 1996) [5] in Haryana, it was observed that the pest incidence increased with an average temperature of about 13.7 °C and a relative humidity 65 percent and decreased with temperature above 35 °C. To mitigate the effects of weather variability, modification in sowing dates could be one option for optimizing the growth and seed yield. However, the mustard average yields in our country yet low as compared to other countries due to many constraints like delay sowing, pest diseases incidence and others management practices. Among different insect pest of mustard, aphid infestation is one of the major problems and widely distributed throughout the world. It causes damage directly by sucking the phloem from the different parts of the plants (Ali and Rizvi, 2007) [1]. The population dynamics of this pest considered to be highly influenced by prevailing weather condition particularly temperature and relative humidity. Several studies have been indicated that weather plays an important role on the aphid appearance, multiplication and disappearance (Srivastava and Srivastava, 1972; Roy, 1975; Jitendra Kumar *et al.*, 1999; Srivastava, 1999; Vekaria and Patel, 2000) [8, 5, 2, 7, 9]. The efforts have been made by Prasad and Phadke (1984) [3]; Rana *et al.*, (1993) [4] to correlate the temperature and relative humidity with the incidence and multiplication of aphid in the mustard crop. The changes in aphid population with change in weather parameters enable to forecast the population of mustard aphid under changing scenarios of climate using statistical approaches. The study would be helpful to challenge the pest by manipulating the manageable ecological parameters like planting or harvesting time adjustment, varietals selection, timely application of insecticides etc.

Materials and Methods
An experiment was conducted during *Rabi* seasons of 2015-16 at student instructional farm NDUA&T Kumarganj Faizabad (U.P.), India on the topic entitled "Effect of variable weather condition on the population dynamic of mustard aphid" The experimental site is located in the main campus of NDUA&T, Kumarganj, (Faizabad) situated at a distance of about 42 km. away from Ayodhya district headquarter on Faizabad Raibarelly road. The geographical situation of experimental site lies at latitudes 26^0 47' North longitude 82^0 12′ East and altitude

of 113 meter from mean sea level in the Indo genetic alluvium of eastern Uttar Pradesh. The details of materials and methods employed & techniques adopted during the course of experimentation has been described in this paper. The experiment was conducted in Split Plot Design (S.P.D) and replicated the three times. The different growth parameters studied were white as phenological stages, Aphid.

Results

Accumulation heat unit/ Thermal unit (GDD)

Data pertaining to accumulated Heat Unit requirement of Indian mustard at different Phenophases as affected by date of sowing varieties and have been presented in Table:1. The maximum heat Unit (GDD) requirement from sowing to maturity were recorded 1447.4^{0}daysat date of sowing (15th, October) while minimum accumulated growing degree daysfrom sowing to maturity1202.2^{0}days was observed under date of sowing (14th, November) Wider date of sowing recorded minimum GDD requirement at all the stages. Different varieties had marked influence on the Thermal unit/ Accumulation heat unit/growing degree days of Indian mustard at all the phenophases. Accumulated GDD ranged from1302.5^{0}days to1380 ^{0}days irrespective of different varieties. Maximum Thermal unit/G.D.D/Accumulation heat unit requirement from sowing to maturity 1380.0^{0}days were obtained in Varuna variety, while minimum thermal unit was obtained in NDR-8501 Variety (1302.5^{0}days) from sowing to maturity of Indian mustard.

Solar radiation interception (MJm^{-2})

Solar radiations interception recorded during entire crop growth period of mustard as affected by date of sowing and varieties are given in Table: 2. When crop was sown on October 15th recorded higher solar radiation (529.2MJm^{-2}). While lowest value of solar radiation at all the stages were recorded under November14thsowing date (463.5MJm^{-2}) leading to poor seed yield. Varuna variety of mustard was relatively more efficient in light interception and hence yielded better seed yield because of higher solar radiation under the Varuna variety followed by NDR-8501.

Aphid population (plant^{-1})

Data pertaining to aphid population per plantas affected by date of sowing and varieties have been presented in Table: 3. A perusal of data showed that date of sowing influenced significantly to the Aphid population. Maximum aphid population (101) 65-DAS was recorded when crop was sown on 14th, November which was significantly affected over 15th, October and 30th, October date of sowing. The minimum aphid population (91) 65-DAS was recorded when sowing was done at 15th, October date of sowing. The aphid population per plant was affected by different varieties. Maximum aphid population (104) 65-DAS was recorded with Vardan variety followed by NDR-8501 (96) and then Varuna (95).

Population dynamics of aphid in relation to weather

The data recorded on aphid population during crop growth period have been presented in Table-4. It is evident from the table that the aphid population activity continued from 52 DAS to physiological maturity. The aphid populations were highest during later stages of crop growth. Relationship between both (T. max & T. min) and aphid population were developed. Minimum temperature was highly correlated than maximum temperature. Trend line for minimum temperature indicates that aphid population increased with increase in minimum temperature, maximum temperature increased the aphid population decrease. Relationship between morning and evening RH and aphid population were developed. Trend line indicates that increased in morning RH increases the aphid population, Increase evening RH increases aphid population. Morning RH was highly correlated than evening RH. Relationship between bright sunshine and aphid population were developed. Trend line indicates that increase in BSS decreases the aphid population per plant. Relationship between rainfall and aphid population were developed. Trend line indicates that increased in rainfall increase the aphid population.

Table 1: Accumulation eat unit/Thermal unit at different phenophases (˚days) of Indian mustard as influenced by different date of sowing and Varieties

Treatments	Phenophases					
	Emergence	Four Leaf Stage	Flower Initiation	Siliquae Initiation	Pod Development	Maturity
date of sowing						
15th, Oct.	101.3	297.5	728.3	789.5	938.9	1447.4
30th, Oct.	100.2	266.3	686.7	753.8	892.5	1361.3
14th, Nov.	77.5	231.7	504.5	570.2	751.2	1202.2
Varieties						
NDR-8501	88.9	261.5	644.0	694.8	863.7	1302.5
Varuna	95.1	272.8	636.2	708.5	857.5	1380.0
Vardan	92.8	263.2	640.8	707.2	862.9	1327.8

Table 2: Solar radiation interception (MJm^{-2}) of Indian mustard as influenced by different date of sowing and Varieties

Treatments	30 DAS	45 DAS	60 DAS	75 DAS	90 DAS	105 DAS	At harvest
date of sowing							
15th, Oct.	86.2	170.9	260.2	364.9	462.5	512.3	529.2
30th, Oct.	78.7	155.6	250.9	340.5	430.2	474.9	470.0
14th, Nov.	73.9	148.2	236.2	323.2	404.7	463.2	463.5
Varieties							
NDR-8501	72.8	143.9	224.0	325.9	426.8	491.5	482.0
Varuna	84.6	145.5	234.8	334.2	463.3	510.0	534.3
Vardan	76.0	142.7	223.5	321.7	412.9	472.8	477.8

Table 3: Aphid population (plant^{-1})

Treatments	Aphid population/plant				
	50 DAS	65 DAS	80 DAS	95 DAS	105 DAS
date of sowing					
15th, Oct.	54	91	48	31	19
30th Oct.,	62	97	42	25	16
14th, Nov.	69	101	54	36	21
Varieties					
NDR-8501	63	96	44	38	16
Varuna	61	95	52	28	14
Vardan	67	104	58	39	18

Table 4: Aphid population per plant during crop growth period.

Week No.	Temperature (^{O}C)		Relative Humidity (%)		Bright Sunshine (hrs)	Rain fall (mm)	Aphid population /Plant
	Min.	Max.	Mor.	Eve.			
42.	19.2	35.2	70.4	52.1	05.8	00	00
43.	18.7	28.8	68.2	53.0	06.1	00	00
44.	13.7	30.3	79.1	53.1	4.6	00	00
45.	13.2	32.6	76.2	44.0	4.6	00	00
46.	12.4	30.7	79.5	43.2	5.6	00	00
47.	11.0	30.6	77.0	43.5	5.6	00	00
48.	12.5	29.5	82.1	51.2	4.6	00	00
49.	9.4	26.1	92.7	64.7	3.5	00	00
50.	7.7	23.8	92.5	59.2	3.2	00	00
51.	5.2	23.0	84.5	47.1	3.9	00	31
52.	6.2	27.2	96.2	52.8	6.1	00	54
1.	6.5	24.9	89.8	47.2	4.9	00	83
2.	7.5	25.1	86.2	48.2	5.1	00	102
3.	6.8	20.1	89.7	65.5	2.7	00	67
4.	5.2	22.7	88.5	52.5	3.1	00	50
5.	8.5	25.6	78.7	48.7	4.6	00	38
6.	7.5	25.4	86.8	46.7	5.3	00	33
7.	6.3	28.3	77.8	43.7	4.8	01.2	17
8.	11.6	28.9	78.7	41.8	06.1	00	13
9.	13.4	29.7	85.2	47.0	8.1	00	00
10.	15.1	32.0	79.4	44.5	7.9	1.4	00

Conclusion

It is concluded that study in aphid populations were highest during later stages of crop growth. Relationship between both (T.max & T.min) and aphid population were developed. Minimum temperature was highly correlated than maximum temperature.

Reference

1. Ali A, Rizvi PQ. Development and predatory performance of *Coccinella septempuncutata* L. on different aphid species. J Biol. Sci. 2007; 7:1478-1483.
2. Jitendra Kumar YP, Malik, Singh SV. Forecasting models for outbreak of *Lipaphis erysimi* on some cultivars of mustard, *Brassica juncea*. Ind. J Entomol. 1999; 61(1):59-64.
3. Prasad SK, Phadke KG, Mehrotra KN. Forecasting of mustard aphid, *Lipaphis erysimi* (Kaltenbach) on rapeseed crop. Proc. Indian Nat. Sci. Acad. (B). 1984; 50:146-153.
4. Rana JS, Khokhar KS, Singh H, Suchetra. Influence of abiotic environment on the population dynamics of mustard aphid *Liphaphis erysimi* (Kalt.) Crop Res. Hisar, 1993; 6(1): 116-119.
5. Roy, Pranab. Population dynamics of mustard aphid, *Lipaphis erysimi* (Kaltenbach) (*Aphididae: Hemiptera*) in West Bengal. Indian J Ent. 1975; 37(3):318-321.
6. Rohilla HR, Singh H, Yadava TP, Singh H. Seasonal abundance of aphid pests on rapeseed-mustard crop in Haryana. Annals Agri. Bio. Res. 1996; 1(1-2):75-78.
7. Srivatsava A. Effect of date of sowing and varieties on the incidence of mustard aphid, *Lipaphis erysimi* (Kalt.) on rapeseed mustard. J Oilseeds Res. 1999; 16(2):380-381.
8. Srivatsava AS, Srivatsava JL. Ecological studies on aphid, painted bug and saw fly attacking mustard and rape in India. F.A.O. Plant Prot. Bull. 1972; 20:136-140.
9. Vekaria MV, Patel GM. Screening of promising Brassica and allied genotypes for resistance against mustard aphid, *Lipaphis erysimi* Kalt. (Homoptera: Aphididae). Applied Biol. Res. 2000; 4(1-2):75-77.
10. Verma KK, Singh NB. Performance of rainfed Indian mustard (*Brassica juncea*) in relation to spacing in diaraland of eastern Uttar Pradesh. Ind. J Agron. 1993; 38(4):654-656.