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Short Communication

A study on high incidence of mustard aphids, *Brevicoryne brassicae* (L.) and *Myzus persicae* (Sulzer) on Gobhi Sarson during warmer and drier winters at Palampur, Himachal Pradesh*

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Oilseeds are an important component of the agricultural economy, next to food grains, in terms of area, production and value. India is among the top few vegetable oil economies of the world and contributes about 28.3% acreage and 19.8% production of the world oilseeds. Gobhi sarson (*Brassica napus*), a long duration crop, is the new emerging oilseed crop in Himachal Pradesh. It has good yield potential, wide adaptability and possesses high oil content of good quality (Shekhawat *et al.*, 2012). But, several biotic and abiotic factors pose as constraints in the production of this crop.

Among various insect pests, *Brevicoryne brassicae* and *Lipaphis erysimi* have been observed to be the most important insect species to cause economic damage on timely sown crops (Raj and Sharma, 1991). Besides, *Myzus persicae* has also been reported as major insect pest of oilseed *Brassica* crops although, population of the *B. brassicae* remains always greater than other species (Razaq *et al*., 2011). The yield losses in rapeseed- mustard may range from 10-90% (Rana, 2005) and even more (Singh and Sachan, 1997). Aphid population build up is highly influenced by several weather factors (Rashid *et al*., 2009).

The pest development is favored by warmer and drier conditions. Therefore, present investigation was aimed to assess the aphid populations and their weather relations in Gobhi sarson under two different thermal environmental conditions.

In order to assess the aphid incidence, build up and their weather relations in three Gobhi sarson varieties (HPN-1, HPN-3 and Hyola-401), two field experiments were conducted in randomised block design with three replications in plot size of 4.5×3 m^2 each at CSK HPKV, farm, Palampur during two *rabi* seasons (2010-11 and 2011-12). The crop was sown on three dates representing three thermal environments i.e., October 25, November 2 and November 10 in each season under unprotected conditions. Recommended package of practices were followed to raise the crop. For aphid population count in each treatment, 10 plants were randomly selected, tagged and aphids were counted from 10 cm top terminal central shoot of each plant (Singh and Lal, 1999) at 3-5 days interval from first date of incidence. Seven observations starting from Feb 21, 23, 27, March 2, 7,11 and 15 during 2010-11 and thirteen observations from Feb 21, 25, 29, March 3, 7,12, 16, 20, 25, 30, April 5, 10 and 16 during 2011-12 were recorded and average population per plant was calculated.

Accordingly, dates of incidence, economic threshold level, ETL (30 aphids $plant^{-1}$) and peak population were calculated. Daily weather data on maximum and minimum temperatures (Tmax and Tmin), morning and evening relative humidity (RH I and RH II) and rainfall three days prior to incidence, ETL and peak population were collected from the records of agrometeorological observatory of the university and used for the study. Seed yields (kg ha^{-1}) from each treatment were recorded at harvest and analysed statistically as per Panse and Sukhatme (1985).

During 2010-11, aphids appeared on 21st February in all the dates of sowing, however, the population was higher in crop sown on third date. First ETL in crops occurred on 23rd February whereas peak activity of *B. brassicae* (mean of three dates, 269.3/10 cm terminal shoot $plant^{-1}$) and *M. persicae* (93/10 cm terminal shoot $plant^{-1}$) was noticed on 2nd March (Table 1). ETL was found to be associated with Tmax of 18.0 ^{o}C (17.0-19.0), Tmin 6.2 ^{o}C (5.5-7.5), Tmean 11.6 ^{o}C (10.8-12.8), RH I 72 % (69- 74), RH II 65 (47-93) and RH mean 68 % (60-81). Peak incidence of aphid was associated with

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Table 1 : Weather parameters on three days prior to incidence, ETL and peak population of aphids in Gobhi sarson during 2010-11 and 2011-12

Weather parameter	At incidence	At ETL	At peak population
Rabi season 2010-11			
Mean max. temperature (°C)	16.4	18.0	15.7
Mean min. temperature (°C)	5.2	6.2	6.0
Mean temperature (°C)	10.8	11.6	10.2
RH I	77	72	76
RH II	55	65	72
Mean RH	66	68	74
Total rainfall (mm)	0.0	1.0	1.8
Aphid population *Brevicoryne brassicae*			
25th October	15	62	233
2nd November	21	79	272
10thNovember	36	85	303
Myzus persicae			
25th October	9	23	70
2nd November	12	27	85
10thNovember	19	31	124
Rabi season 2011-12			
Mean max. temperature (°C)	17.2	17.2	19.6
Mean min. temperature (°C)	7.2	7.2	7.0
Mean temperature (°C)	12.2	12.2	13.3
RH I	85	85	57
RH II	56	56	36
Mean RH	71	71	47
Total rainfall (mm)	9.6	9.6	0.0
Aphid population *Brevicoryne brassicae*			
25th October	106	106	869
2nd November	145	145	1204
10thNovember	201	201	1351
Myzus persicae			
25th October	56	56	412
2nd November	78	78	821
10thNovember	86	86	940

Tmax of 15.7°C (14.5-17.5), Tmin 6.0°C (4.0-8.0), Tmean 10.2 °C (7.5 -12.8), RH I 76 % (65-85), RH II 72 % (51-86) and RH mean 74 % (52-84). Though, the Tmean was higher by 3°C compared to 2011-12 but 38.5 mm of rain occurred during 6-12th March might have caused dislodging of the pests.

Incidentally, aphid incidence during 2011-12 was also noticed on 21st February, 2012 and on the same day the population was found to be above ETL. Incidence of aphid and ETL were associated with Tmax of 17.2°C (16.5 - 18.5), Tmin 7.2 °C (6.5 - 8.0), Tmean 12.2 °C (11.8 -12.8), RH I 85 %

Table 2: Effect of date of sowing and variety on grain yield of Gobhi sarson

Date of sowing	2010-11	2011-12
25th October	1745	1372 (21.4)*
2nd November	1449	975 (32.7)
10thNovember	1403	456 (67.5)
LSD (P=0.05)	97	121
Variety		
HPN-1 (Sheetal)	1399	1074 (23.2)
HPN-3 (Neelam)	1580	974 (38.4)
Hyola 401	1617	784 (51.5)
LSD (P=0.05)	97.0	NS

*values in parentheses give reduction on yield compared to 2010-11

(73-87), RH II 56 % (51-60) and RH mean 71 % (69-72). Tmax 19.6 °C (19.5 - 20.0), Tmin 7.0 °C (5.0-8.5), Tmean 13.3 °C (12.9-14.3), RH I 57 % (42-72), RH II 36% (33-42) and RH mean 47 % (38-54) were associated with the peak incidence of aphid.

Compared to 2010-11, high aphid activity for longer period was noticed during 2011-12 and this was attributable to favourable weather conditions during the season for population build up. The aphid population was considerably higher because of low rainfall and prevailing high temperature during second fortnight of February. Peak population of *B. brassicae* (mean of three dates of sowing, 1141.3/10 cm terminal shoot plant^{-1}) and *M. persicae* (724.1/10 cm terminal shoot plant^{-1}) was recorded on 3rd March. Higher Tmean and lower humidity by 3°C, 15-27% and 2-4°C, 7-21% during III and IV observations (between 25th February-3rd March) and X, XI and XII observations (between 6th-16th March) respectively, appeared to be responsible for higher incidence of the pests.

Rainfall during second fortnight of February (14.4 mm) and after aphid incidence during aphid activity was lower (69.1 mm) during 2011-12 compared to 2010-11. The corresponding values for 2010-11 were 110.8 and 143.7 mm, respectively.

Lower rainfall and prevailing higher temperature during second fortnight of February produced considerably higher aphid population of both the species. Also critical periods (having greater than 30 aphids plant^{-1}) of exposure of crops to aphid infestation prevailed in first week of March during both the seasons. Raj and Sharma (1991) had also reported similar results. The incidence of mustard aphid is affected by weather conditions prevailing during the growing season of *Brassica* crop (Dhaliwal and Hundal, 2004). Besides, higher maximum temperature, minimum and mean temperature and higher morning humidity also favoured high build up of aphid during 2011-12. This revealed that infestation of aphid on Gobhi sarson was largely governed by the temperature and relative humidity. The results are in conformity with earlier reports of Saxena *et al*. (2012).

Maximum temperature (>15 °C) three days prior to incidence favoured higher population build up. Same temperature regime observed earlier during second fortnight of February also favoured aphid incidence and build up under mid hill conditions of the state (Anonymous, 2011).

Based on the two years study, for attaining ETL, Tmax ranged between 16.5- 19.0°C, Tmin (5.5-8.0°C) and Tmean (10.8 - 12.8°C). For peak population, Tmax (14.5-20.0°C), Tmin (4.0 - 8.5°C) and Tmean (7.5 - 14.3°C) were observed.

During both the seasons, 25th October date of sowing gave significantly higher seed yield whereas 10th November date of sowing gave significantly lower yield during 2011-12 (Table 2). With delay in sowing, yield decreased progressively from 1372 to 456 kg ha^{-1} (66.8 %). HPN 1 (1074 kg ha^{-1}) out yielded the other two varieties during 2011-12 though, remained statistically at par. Warmer and drier weather conditions during 2011-12 were found to be favourable for the pest development which ultimately led to the severe reduction in yield.

Compared to 2010-11, the average reduction in seed yield was found to be 21.4, 32.7 and 67.5 % in first, second and third date of sowing respectively, with the overall reduction in yield by 40.5 %. Among varieties, the reduction was highest (51.5%) in Hyola 401 followed by HPN 3 (38.4 %) and HPN 1 (23.2 %) indicating that hybrids are more tolerant to aphid attack. Aphid population was also high on the crop sown on third date of sowing followed by second and first date during both the seasons. Earlier Dhaliwal *et al*. (2008) had also reported similar observations.

Based on the present study, it was concluded that the mean temperature 10.8-12.2 and 10.2-13.3°C, mean RH 66-71 and 47-74 % were conducive for aphid incidence and peak population build up, respectively. Since the aphid population was higher in late sown crops as compared to early sown, timely sowing of crops would be one of the important

strategies for escaping aphid attack under mid hills of Himachal Pradesh.

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