

STUDY ON POPULATION DYNAMICS OF WHEAT APHID AND ITS NATURAL ENEMIES (PARASITE AND PREDATORS)

K.K. Bhati*
Vijay Upadhyay**

ABSTRACT

The abundance of aphid infesting wheat and their natural enemies was studied at Instructional farm of Mewar University, Gangrar Chittorgarh during three consecutive years (2018- 2020). The aphids, Rhopalosiphum padi, population commenced from 1st week of January every year and reached a peak during the fifth metrological week. Coccinellid beetles and grubs were recorded as predators Coccinella suptempunctata. Aphid peracitiazation by Diaeretiella species was initiated in the fourth metrological week and its peak was in fifth metrological week with percent peracitiazation. The natural enemies showed significant positive correlation with aphids population and negative Correlation with temperature. The adults as well as grubs of lady bird beetle have potential to spur aphids' population.

Keywords: Wheat Aphids, Coccinella suptempunctata, population , Diaeretiella species.

INTRODUCTION

Wheat (*Triticum* spp.) belongs to family Poaceae, and is an annual grass; culms simple, erect, hollow or pithy, glabrous, up to 1.2 m tall; with leaves flat, narrow, 20–38 cm long, about 1.3 cm broad; spikes long.

It is a cereal grain, originally from the Levant region of the Near East but now cultivated worldwide. The total area under Wheat in the world is around 225.62 million ha with a production of 685.6 million tonnes (2009-10). The normal world productivity is 3039 kg/ha. The major wheat producing countries are China, India, USA, France, Russia, Canada,

*K.K. Bhati is Professor (Entomology) in the Faculty of Agriculture and Veterinary Science, Mewar University, Gangrar, Chittorgarh Rajasthan- 312901.

** Vijay Upadhyay is Assistant Professor (Forestry) In The Faculty of Agriculture and Veterinary Science, Mewar University, Gangrar, Chittorgarh Rajasthan- 312901. Email : vijayu@mewaruniversity.co.in

Australia, Pakistan, Turkey, UK, Argentina, Iran and Italy. These countries contribute about 76% of the total global wheat production.

India stands first in area and second in production next to China in the world. India's share in world wheat area is about 12.40%, whereas it occupies 11.77 % share in the total world wheat production. In terms of domestic production, U.P. occupies first place followed by Punjab, Haryana, Madhya Pradesh, Rajasthan, Bihar, Maharashtra, Gujarat, West Bengal, Uttarakhand, Himachal Pradesh, Jammu & Kashmir and Karnataka. The contribution of these states in the production is about 99.5%.

This grain is grown on more land area than any other commercial food. World trade in wheat is greater than for all other crops combined. Globally, wheat is the leading source of vegetarian protein in human food, having a higher protein content than other major cereals, maize (corn) or rice. In terms of total production tonnages used for food, it is currently second to rice as the main human food crop and ahead of maize, after allowing for maize's more extensive use in animal feeds.

MATERIALS AND METHODS

A field experiment was conducted for three conjunctive years (2018- 2020) at Instructional farm Mewar University, Gangrar, Chittorgarh to find out initiation of wheat aphid & its natural enemies there pick population & decline. The date of sowing were in the first week of November every year. The plot size was 4M by 3M (12 square meters) row to row distance was 21 cm & plant to plant distance was 15cm, all recommended agronomic practices were followed. Weekly observation on the initiation of wheat aphid & its parasite were recorded & percent peracitiazation were calculated. The final plant stand per plot at harvest & lady bird beetle both grub & adults were recorded.

RESULT

The data revealed that aphid initiation was recorded from 1st meteorological week every year & it was 24.27, 24.87 & 15.53 aphids per 10cm twig/ year head in the 2018, 2019 & 2020 respectively. It increases till 7th meteorological week with its pick of 44.66, 44.93 & 34.8 aphids per 10cm twig/ear head in the year 2018, 2019 & 2020 respectively. Wheat aphid population decreases from 8th meteorological week & lowest population were recorded in 13th meteorological week in the year 2018 (14.70), 2019(14.73) & 2020(15.33) aphids per 10cm twig/year.

Its peracitiazation was initiated from 4th meteorological week during 2018(1.33), 2019(1.33) and in the 5th meteorological week in the year 2020(1.33). Its peak was observed in 9th meteorological week in 2018(27), 2019 (28) and 2020(24) respectively.

The percent peracitiazation was 3.8, 3.9 & 4.48 percent during 2018, 2019 & 2020 respectively in the 4th meteorological week. Peracitiazation increases & reached its peak in the 10th meteorological week in the year 2018(90) and in the 9th meteorological week 2019(91.05) & 2020(86.12), respectively. Mean mummified aphid were recorded 23.3,

20 & 24 during 2018, 2019 & 2020 respectively. The maximum percent peracitiazation ranges from 2018 (90%) in the 10th meteorological week and 9th meteorological week in 2019(91.5%) & 2020(86%). Then it starts decreasing. The minimum aphid population were recorded in 13th meteorological week during every year in 2018, 2019 & 2020. Minimum mummyphide aphids were recorded in the 4th meteorological week of 2018 & 2019(1.33&1.33) and in the 5th meteorological week of 2020(1.33)

Similarly aphid population decreases from 8th meteorological week with 35.2 aphids & 25 M mummyphide aphids with percent peracitiazation of 71.02% during 2018. the lowest aphid population was 35.27 & mummyphide aphid population was 25 with percent peracitiazation of 70.89% during the year 2019. Minimum aphid population 30.13 & minimum Mummyphide 12.7 with percent peracitiazation 42.04 in the 8th meteorological week during the year 2020.

At harvest, grub of lady bird beetle were recorded from 5th meteorological week ranging from 1.0, 1.3 & 1.0 grub per plant avg. of 3 plants during 2018, 2019 & 2020 respectively.

It increases & its peak were recorded in the 9th meteorological week ranging from 9.33, 8.00 & 10.66 grub per plant (avg. of 3 plants) during 2018, 2019 & 2020 respectively.

Then its starts declining & minimum grub recorded ranging from 0.66, 1.00 & 0.33 during 2018, 2019 & 2020 respectively in 13th meteorological week.

Adult lady bird beetle were recorded per plant (avg. of 3 plants). Its initiation started from 8th meteorological week with it population 0.66, 1.0 & 1.33 during 2018, 2019 & 2020 respectively.

Thereafter, it increases and its peak was observed in 10th meteorological week having 4.33, 5.00 & 4.66 beetle per plant during 2018, 2019 & 2020 respectively.

Then its starts decreasing. Minimum adult lady bird beetle were recorded ranging from 0.33, 1.00 & 0.66 beetle per plants avg. of 3 plants during 10th meteorological week during 2018, 2019 & 2020 respectively.

The aphids population differ non-significantly in the year 2018,2019 & 2020 it differ significantly during 2nd , 4th , 12th and 13th meteorological week at 5% & 1% label of significance .[Figure 1 & Table 1]

Mummyphide aphids population differ significantly during 2018, 2019 & 2020 and it is at 5% & 1% label significance during the year 2019, in the 6th, 7th, 8th and 9th meteorological week. During 2020, mummyphide population vary significantly during 6th,7th and 9th meteorological week (Figure 2 and Table 2).

Percent peracitiazation is significant at 5% & 1% label significant during 5th ,6th , 7th ,8th and metrological week (Figure 3 & Table 3).

Yield of wheat is recorded at harvest & it was 19.82, 21.66 & 20.40 quintiles per hector during 2018, 2019 & 2020 respectively.

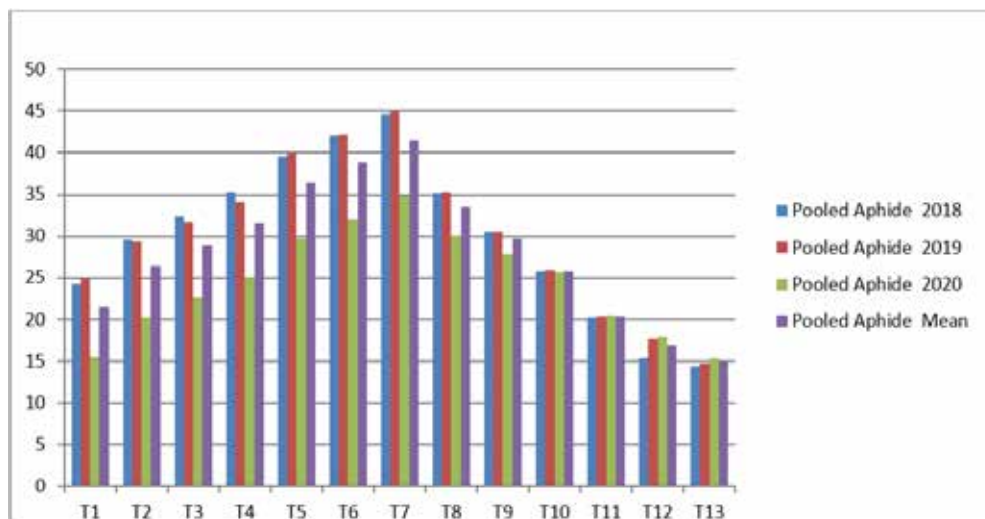


Figure 1: Bar Diagram of Pooled Aphids population 2018, 2019 & 2020.

Table 1: Anova for Pooled Aphids population in Year 2018, 2019 & 2020

FOR 5 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-30956	-15478	-20	3.4	NS
TREAT.	12	2451.15	204.262	0.26394	2.18	NS
ERROR	24	18573.7	773.906			
TOTAL	38	-9931.2				
S.V.	SE (m)	SE (d)	CD @ 5%	C.V.	CD @ 5%	G.M.
TREAT.	16.0614	22.7143	46.8595	#DIV/0!	47.1094	28.1735
FOR 1 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-30956	-15478	-20	5.61	NS
TREAT.	12	2451.15	204.262	0.26394	3.03	NS
ERROR	24	18573.7	773.906			
TOTAL	38	-9931.2				
S.V.	SE (m)	SE (d)	CD @ 1%	C.V.	CD @ 1%	G.M.
TREAT.	16.0614	22.7143	63.5045	#DIV/0!	64.0315	28.1735

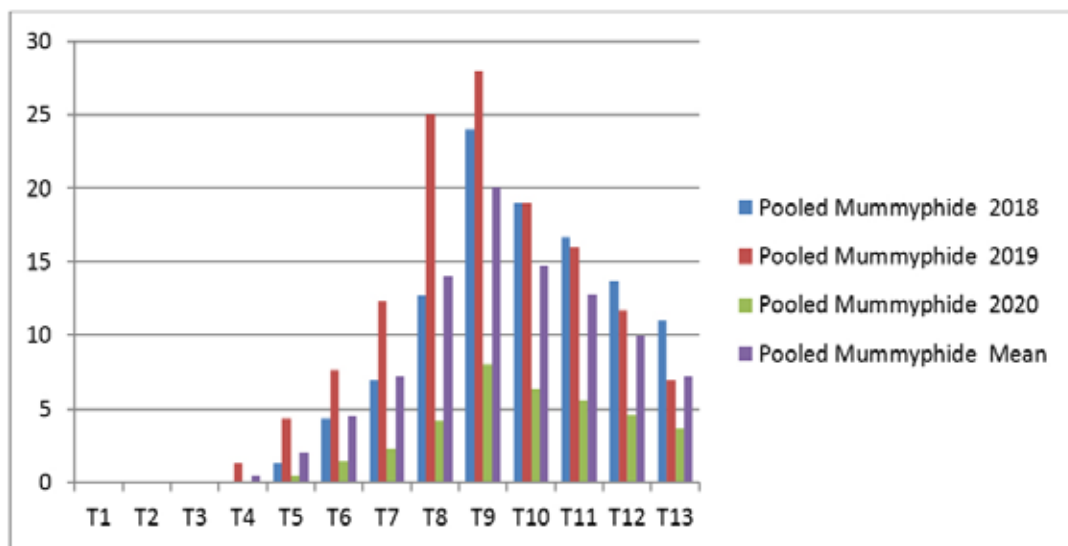


Figure 2: Bar Diagram of Pooled Mummyphide (2018- 2020)

Table 2: Anova for Pooled Mummyphide(2018-2020)

FOR 5 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-1989.5	-994.76	-73.158	3.4	NS
TREAT.	12	1620.94	135.079	9.93406	2.18	S
ERROR	24	326.34	13.5975			
TOTAL	38	-42.238				
S.V.	SE (m)	SE (d)	CD @ 5%	C.V.	CD @ 5%	G.M.
TREAT.	2.12897	3.01082	6.21131	#DIV/0!	6.24443	7.14236
FOR 1 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-1989.5	-994.76	-73.158	5.61	NS
TREAT.	12	1620.94	135.079	9.93406	3.03	S
ERROR	24	326.34	13.5975			
TOTAL	38	-42.238				
S.V.	SE (m)	SE (d)	CD @ 1%	C.V.	CD @ 1%	G.M.
TREAT.	2.12897	3.01082	8.41764	#DIV/0!	8.48749	7.14236

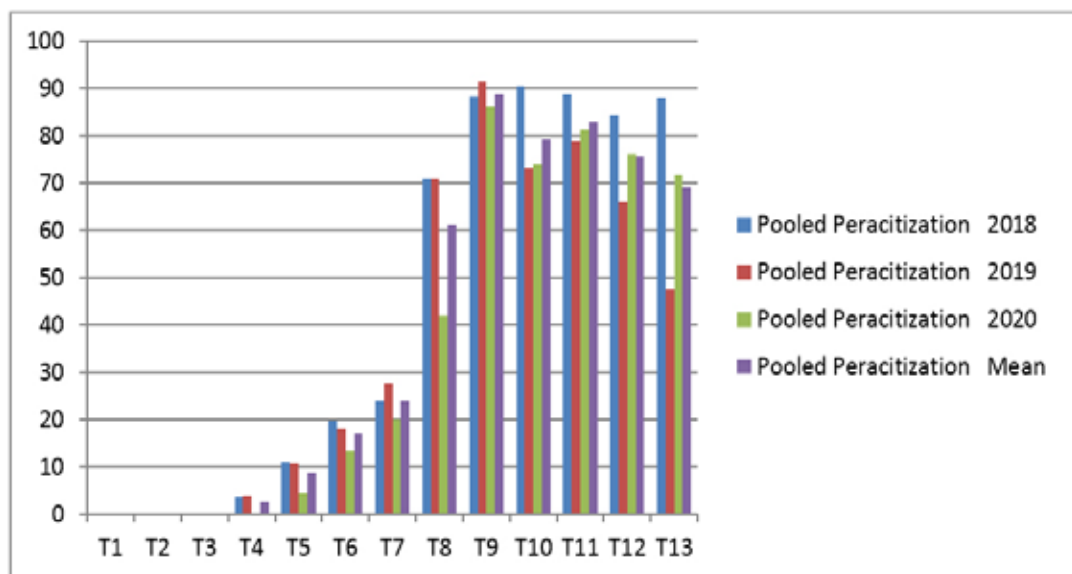


Figure 3: Bar Diagram of Pooled Percent Peracitization(2018- 2020)

Table 3 :Anova for Pooled Percent Peracitization(2018- 2020)

FOR 5 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-59783	-29891	-24.805	3.4	NS
TREAT.	12	48783.5	4065.29	3.37358	2.18	S
ERROR	24	28920.8	1205.04			
TOTAL	38	17921.6				
S.V.	SE (m)	SE (d)	CD @ 5%	C.V.	CD @ 5%	G.M.
TREAT.	20.0419	28.3435	58.4727	#DIV/0!	58.7845	39.1521
FOR 1 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-59783	-29891	-24.805	5.61	NS
TREAT.	12	48783.5	4065.29	3.37358	3.03	S
ERROR	24	28920.8	1205.04			
TOTAL	38	17921.6				
S.V.	SE (m)	SE (d)	CD @ 1%	C.V.	CD @ 1%	G.M.
TREAT.	20.0419	28.3435	79.2429	#DIV/0!	79.9005	39.1521

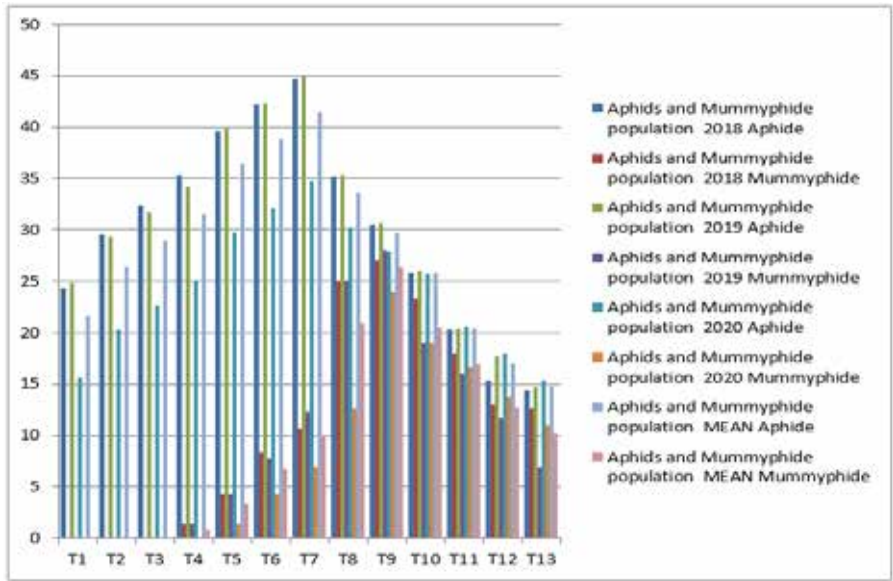


Figure 4: Bar Diagram of Pooled Aphids and Mummyphide population(201819 & 2020)

Table 4: Anova for Pooled Aphide and Mummyphide (2018-19 & 2020)

FOR 5 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-52791	-26396	-5.7117	3.4	NS
TREAT.	12	-61446	-5120.5	-1.108	2.18	NS
ERROR	24	110913	4621.36			
TOTAL	38	-3324.5				
S.V.	SE (m)	SE (d)	CD @ 5%	C.V.	CD @ 5%	G.M.
TREAT.	39.2486	55.5059	114.509	52.8803	115.119	40.8744
FOR 1 %						
ANOVA TABLE FOR RBD WITH 12 TREATMENTS AND 3 REPLICATIONS						
S.V.	D.F.	S.S.	M.S.S.	CAL. F	TAB. F	F TEST
REPLI.	2	-52791	-26396	-5.7117	5.61	NS
TREAT.	12	-61446	-5120.5	-1.108	3.03	NS
ERROR	24	110913	4621.36			
TOTAL	38	-3324.5				
S.V.	SE (m)	SE (d)	CD @ 1%	C.V.	CD @ 1%	G.M.
TREAT	39.2486	55.5059	155.183	52.8803	156.471	40.8744

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