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INFLUENCE OF GROUNDNUT BASED INTERCROPPING SYSTEM ON MAJOR SUCKING INSECT-PESTS IN GROUNDNUT, *ARACHIS HYPOGAEA* LINNAEUS

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ABSTRACT : The field experiment was carried out during *Kharif* 2018 and 2019 at the Zonal Agricultural and Horticultural Research Station (ZAHRS), Hiriyur, Chitradurga district, Karnataka to find out cost-effective groundnut based intercropping system for the management of sucking pests *viz*., thrips and leafhoppers. Among eight intercrops, groundnut + bajra (1.10/top trifoliate leaves and 1.25/plant), groundnut + sorghum (1.17/top trifoliate leaves and 1.35/plant), groundnut + maize (1.24/top trifoliate leaves and 1.40/plant) and groundnut + cowpea (1.17/top trifoliate leaves and1.29/plant) recorded the lowest pooled mean population of thrips and leafhoppers during the years 2018 and 2019, respectively as compared to groundnut as a sole crop (2.17/top trifoliate leaves and 2.38/plant). Whereas the highest pooled mean population of thrips and leafhoppers recorded in remaining intercrops *viz*., groundnut + redgram (1.70/top trifoliate leaves and 1.89/plant), groundnut + soybean (1.73/top trifoliate leaves and 1.93/plant), groundnut + sesame (1.96/top trifoliate leaves and 2.12/plant) and groundnut + onion (2.05/top trifoliate leaves and 2.14/plant) which were on par with sole groundnut (2.17/top trifoliate leaves and 2.38/plant), respectively.

Key words : Groundnut, intercropping systems, leafhoppers, thrips.

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INTRODUCTION

Groundnut (*Arachis hypogaea* Linnaeus) is an annual important legume crop in the world and (*Arachis hypogaea* L.) is grown in many countries of the tropical, sub-tropical, and warm temperate regions. It is mainly cultivated for its high-quality edible oil and digestible protein. Asia and Africa contribute about 90% of the global groundnut production by small holding farmers under rainfed conditions. The main constraints for the low productivity of groundnut include adverse climatic conditions, poor quality seeds, diseases and insects which affect both the quality and production of groundnut.

Pests and diseases are the major biotic factors affecting the groundnut crop and groundnut crop is attacked by sucking as well as lepidopteran pests. Major sucking pests attacking the groundnut crop are leafhopper, aphids, and thrips, which infest the crop from the vegetative stage till the harvest resulting decrease in yield and extreme cases complete failure of the crop. Under these situations, intercropping can play a significant role to enhance productivity and profitability per unit area and time through more efficient use of land (Partiban *et al*, 2018).

Intercropping system is primarily used to change the bio-diversity of pests and is beneficial on the main crop, this leads to a change in crop canopies and brings about a resultant change in the climate at the micro-level (Prasad and Kumar, 2002). Further, taller intercrops have been observed to check the dispersal of flying insect pests of shorter crops, thus preventing migration towards the main crop (Leon *et al*, 1997). Sorghum intercropped with garlic or onion reduced the shoot fly incidence on main crop. These intercrops can be used for the management of shoot fly with paired row planting of sorghum without affecting plant population (Karibasavaraja *et al*, 2005). The results of Balikai and Bhagwat (2009) revealed that the treatment having intercropping of chickpea with

sorghum (2:2) + seed treatment with thiamethoxam 70 WS @ 3 g/kg seed, was most effective in reducing the shoot fly, shoot bug and aphid incidence on main crop sorghum. Therefore, the present field experiment was undertaken to study the impact of intercropping on the incidence of sucking pests in groundnut.

MATERIALS AND METHODS

The field experiment was conducted during *Kharif* 2018 and 2019 at the Zonal Agricultural and Horticultural Research Station (ZAHRS), Hiriyur, Chitradurga district, Karnataka. The location of experimental site is situated in the Central dry dry zone (Zone-IV) of Karnataka between the 16° 15´ N latitude, 77° 20´ E longitude and at 398.37 m above mean sea level. This was carried out in a randomized completely block design (RCBD) with nine treatments and each treatment was replicated thrice with eight different intercrops compared with sole groundnut. Groundnut seeds were sown in the field with a spacing of 30 × 10 cm and along with eight intercrops as other treatments in the ratio of 4:1 with a standard package of practices. The crops/ varieties *viz*., Bajra (Local), Sorghum (Maldandi), Redgram (BRG-2), Maize (Private), Onion (Arka Kalyan), Sesamum (Local), Cowpea (UAHS-28) and Soybean (DSB-21) were used as intercrops with groundnut (TMV-2). The treatment consisted of growing one row of bajra after every four rows of groundnut and the same procedure was done for other intercrops with groundnut having recommended spacing. No plant protection measures were taken throughout the season.

Observations were recorded on the population of sucking pests *viz*. leafhopper, *Empoascanara* sp. and thrips, *Scirtothrips dorsalis* Hood in 10 randomly selected groundnut plants in each intercropping system and groundnut as pure crop, commencing from 20 days after sowing to 90 days after sowing at 10 days interval. Data obtained from the field study were subjected to ANOVA (Analysis of Variance). In order to know the interaction between treatments, data were subjected to factorial RBD analysis and the means obtained were separated by LSD (Least Significant Difference) (Gomez and Gomez, 1984).

RESULTS AND DISCUSSION

Results obtained from field experiments on the impact of intercrops on the incidence of thrips, *S. dorsalis* in groundnut indicated that groundnut + bajra (0.32/top trifoliate leaves), groundnut + sorghum (0.33/top trifoliate leaves), groundnut + maize (0.42/top trifoliate leaves) and groundnut + cowpea (0.38/top trifoliate leaves) recorded significantly lowest pooled mean population of thrips for

Table 1 : Population of thrips, *Scirtothrips dorsalis* on groundnut-based intercropping during *kharif* 2018 and 2019.

S. No.	Treatments	Number of thrips /trifoliate leaves								Mean
		20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS	
1	Groundnut + Bajra	0.32(0.90)	0.77(1.13)	1.05(1.24)	1.15(1.28)	1.50(1.41)	1.43(1.39)	1.58(1.44)	0.98(1.22)	1.10(1.25)
2	Groundnut + Sorghum	0.33(0.91)	0.77(1.12)	1.07(1.25)	1.20(1.30)	1.63(1.46)	1.65(1.47)	1.67(1.47)	1.07(1.25)	1.17(1.28)
3	Groundnut + Maize	0.42(0.96)	0.92(1.19)	1.18(1.30)	1.27(1.33)	1.68(1.48)	1.68(1.48)	1.75(1.50)	1.03(1.24)	1.24(1.32)
4	Groundnut + Redgram	0.70(1.09)	1.27(1.33)	1.57(1.44)	1.90(1.55)	2.23(1.65)	2.13(1.62)	2.27(1.66)	1.57(1.44)	1.70(1.48)
5	Groundnut + Sesamum	0.83(1.15)	1.52(1.42)	1.75(1.50)	2.17(1.63)	2.57(1.75)	2.47(1.72)	2.57(1.75)	1.80(1.52)	1.96(1.57)
6	Groundnut + Cowpea	0.38(0.94)	0.83(1.15)	1.10(1.26)	1.22(1.31)	1.55(1.43)	1.65(1.47)	1.65(1.47)	0.97(1.21)	1.17(1.29)
7	Groundnut + Onion	0.95(1.20)	1.57(1.44)	1.85(1.53)	2.42(1.71)	2.57(1.75)	2.55(1.75)	2.73(1.80)	1.80(1.52)	2.05(1.60)
8	Groundnut + Soybean	0.75(1.12)	1.30(1.34)	1.60(1.45)	1.85(1.53)	2.30(1.67)	2.17(1.63)	2.30(1.67)	1.58(1.44)	1.73(1.49)
9	Groundnut pure crop	1.03(1.24)	1.65(1.47)	2.00(1.58)	2.45(1.72)	2.75(1.80)	2.68(1.78)	2.88(1.84)	1.93(1.56)	2.17(1.64)
	S.Em.±	0.04	0.04	0.04	0.03	0.03	0.04	0.03	0.04	0.04
	C.D. (P = 0.05)	0.13	0.12	0.13	0.10	0.10	0.13	0.11	0.12	0.13

Figures in the parenthesis are $\sqrt{x+0.5}$ transferred values

the two years 2018 and 2019, as compared to groundnut as a sole crop (1.03/top trifoliate leaves) on 20 days after sowing (DAS). Whereas the highest pooled mean population of thrips were recorded in remaining intercrops *viz*., groundnut + redgram, groundnut + soybean, groundnut + sesame and groundnut + onion were 0.70, 0.75, 0.83 and 0.95 per trifoliate leaves, respectively and were on par with sole groundnut (1.03/top trifoliate leaves). The population trend of thrips observed was similar throughout the growing period from 30 to 90 DAS (Table 1).

The least pooled mean population of thrips, *S. dorsalis* over control was recorded in groundnut + bajra (1.10), groundnut + cowpea (1.17), groundnut + sorghum (1.17) and groundnut + maize (1.24) during 2018 and 2019. However, the highest pooled mean population of thrips were recorded in groundnut + redgram (1.70/ trifoliate leaves), groundnut + soybean (1.73), groundnut + sesamum (1.96) and groundnut + onion (2.05/ trifoliate leaves) which were more or less equal with a population of thrips in sole crop (2.17/ trifoliate leaves) (Table 1).

With respect to the incidence of leafhopper, *Empoascanara* sp. the lowest pooled mean population of leafhoppers of two years (2018 and 2019) was observed in groundnut + bajra (0.40/plant), groundnut + sorghum (0.43/plant), groundnut + maize (0.48/plant) and groundnut + cowpea (0.57/plant) over groundnut as a sole crop (1.23/plant) on 20 days after sowing (Table 2). Whereas, the highest pooled mean population of leafhoppers was noticed in groundnut + redgram (0.90/ plant), groundnut + sesame (1.0), groundnut + soybean (0.97) and groundnut + onion (1.07/ plant) and were on par with sole groundnut (1.23/ plant). A similar trend in the population of leafhoppers was observed throughout the crop growth period from 30 to 90 DAS (Table 2).

The least pooled mean population of leafhopper, *Empoascanara* sp. was observed in groundnut + bajra (1.25/plant), groundnut + cowpea (1.29/plant), groundnut + sorghum (1.35/plant) and groundnut + maize (1.40/plant) for the two years (2018 and 2019). Whereas, the population of leafhoppers was highest with groundnut + redgram (1.89/plant), groundnut + soybean (1.93/plant), groundnut + sesamum (2.12/plant) and groundnut + onion (2.14/plant) (Table 2) and population were more or less equal with sole groundnut (2.38/plant).

Intercropping is one of the important cultural practices in pest management, reducing insect pests by increasing the diversity of an eco-system (Altieri and Letourneau, 1982). Intercropping affects the pests by changing micro-climate through the change in crop canopies (Wu *et al*,

Table 2 : Population of leafhoppers, *Emposca kerri* on groundnut-based intercropping during *Kharif* 2018 and 2019.

S. No.	Treatments	Number of leafhoppers /plant								Mean
		20 DAS	30 DAS	40 DAS	50 DAS	60 DAS	70 DAS	80 DAS	90 DAS	
1	Groundnut + Bajra	0.40(0.95)	0.98(1.22)	1.37(1.36)	1.48(1.41)	1.68(1.48)	1.70(1.48)	1.67(1.47)	0.75(1.12)	1.25(1.32)
2	Groundnut + Sorghum	0.43(0.97)	1.07(1.25)	1.47(1.40)	1.58(1.44)	1.80(1.52)	1.83(1.53)	1.75(1.50)	0.85(1.16)	1.35(1.36)
3	Groundnut + Maize	0.48(0.99)	1.12(1.27)	1.50(1.41)	1.70(1.48)	1.87(1.54)	1.90(1.55)	1.78(1.51)	0.83(1.15)	1.40(1.38)
4	Groundnut + Redgram	0.90(1.18)	1.53(1.43)	2.00(1.58)	2.22(1.65)	2.35(1.69)	2.50(1.73)	2.32(1.68)	1.33(1.35)	1.89(1.55)
5	Groundnut + Sesamum	1.00(1.22)	1.80(1.52)	2.30(1.67)	2.33(1.68)	2.77(1.81)	2.70(1.79)	2.55(1.74)	1.50(1.41)	2.12(1.62)
6	Groundnut + Cowpea	0.57(1.03)	0.98(1.22)	1.30(1.34)	1.52(1.42)	1.77(1.50)	1.78(1.51)	1.67(1.47)	0.72(1.10)	1.29(1.35)
7	Groundnut + Onion	1.07(1.25)	1.88(1.54)	2.35(1.69)	2.37(1.69)	2.73(1.80)	2.67(1.78)	2.58(1.75)	1.50(1.41)	2.14(1.62)
8	Groundnut + Soybean	0.97(1.21)	1.57(1.44)	2.05(1.60)	2.23(1.65)	2.37(1.69)	2.47(1.72)	2.37(1.69)	1.40(1.38)	1.93(1.56)
9	Groundnut pure crop	1.23(1.32)	2.02(1.58)	2.55(1.75)	2.77(1.81)	3.00(1.87)	3.02(1.88)	2.83(1.83)	1.63(1.46)	2.38(1.71)
	S.Em.±	0.03	0.04	0.04	0.03	0.04	0.03	0.04	0.04	0.04
	C.D. (P = 0.05)	0.09	0.12	0.13	0.10	0.14	0.10	0.12	0.12	0.13

Figures in the parenthesis are $\sqrt{x+0.5}$ transferred values.

1999; Srinivas Rao *et al*, 2003), influencing the pest population build-up through physical factors like protection from wind, shading, sheltering, prevention of dispersal, alteration of colour, shape of the stand, *etc*. and through biological factors like presence of natural enemies, production of adverse chemical stimuli, availability of alternate food, *etc*. The present results are endorsed with the findings of Dhaliwal and Arora (1998), who reported that intercropping of groundnut with pearl millet reduced the incidence of thrips and leafhoppers.

Among the eight intercrops tried, groundnut + bajra, groundnut + sorghum, groundnut + maize and groundnut + cowpea were best in reducing the population of sucking pests when compared to other intercropping systems and sole groundnut.

Vinod *et al* (2016) documented that among different intercropping systems tried in groundnut under organic system, the highest coccinellid population was recorded in groundnut + cowpea (3.00/plant) followed by groundnut + red gram (2.40/plant) and groundnut + sorghum (2.13/plant) at 60 days after sowing (DAS). A similar trend was followed under conventional systems also with highest population in groundnut + cowpea (2.07/plant) system. Spider population was maximum at 60 DAS under both systems in groundnut + field bean intercropping system, which recorded 2.93 and 1.97 per plant, respectively. These results support the present findings.

Allelochemicals emanated from intercrop of the present study might be responsible to repel the herbivoures of groundnut, as pointed out by Murali Baskaran and Thangavelu (1990) and Kennedy *et al* (1989). The presence of allelochemicals in intercrops worked well in reducing the incidence of herbivores in several intercropping systems (Degri *et al*, 2014).

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