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Identification of Suitable Intercrops that suppresses the Insect pests of Maize (*Zea mays* Linn.)

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ABSTRACT

A field trial was conducted at farm of S. V. Agricultural College, Tirupati to find out suitable intercropping systems that suppresses insect pests population in maize, during *Kharif*, 2012. The intercropping systems studied were maize + black gram, maize + green gram, maize + cowpea, maize + groundnut, maize + cluster bean, maize + field bean. Pure maize crop was also maintained. Sucking pests like Shoot bug, Sugarcane leaf hopper and aphids were predominantly recorded during crop growth period. Shoot bug population was observed lowest in maize +field bean (0.92/Plant) and was succeeded by Maize + cluster bean (1.02/plant). Sugarcane leaf hopper density was observed lowest in maize + cluster bean system (0.61/plant), followed by maize + groundnut system (0.63/plant) and Maize + field bean (0.84/Plant). Aphid population was found in tasseling and cob formation stage. Lowest numbers were found in maize along with cluster bean intercropping system (19.39/plant) followed by maize + groundnut (20.47/plant).

Key words : Maize, shoot bug, sugarcane leaf hopper, aphids, intercropping, sole crop.

Maize (*Zea mays* L.) is one of the most important cereal of the world. In India, It ranks third important crop after rice and wheat. It is source of human food 35%, animal food 25% and poultry feed 25%, industrial products (starch, popcorn, alcohol and seed) 15%.

India is the sixth largest producer of maize in the world with 7.18 m ha area and 21.21 million tons production. The average productivity in India is 109 kg/ha is much less as compared to U.S. 863 kg/ha. The reasons for low productivity may be environmental factors, low mechanisation techniques, lack of improved varieties, pests and diseases etc.

Insect pests of maize crop inflicts serious losses both directly by eating, sap sucking and indirectly as a vectors of diseases. More than 141 insect pests cause varying degree of damage to maize crop right from sowing till harvest. To lower down the use of chemical pesticides that pose environmental pollution there is need to identify the suitable alternatives. The present study was taken up to record the suitable intercrops that un-favours the maize insect pests.

MATERIAL AND METHODS

A field experiment in RBD was conducted during 2012 *kharif* season with maize variety Godavari 898 (Hybrid) at dry land farm, S. V. Agricultural college, Tirupati. Seven treatments were replicated three times in a plot size of 6 m × 5 m. The crops viz. Black gram (PU-31), Green gram (LGG-460), Cowpea (TPTC-29), Groundnut (Narayani), Field bean (TFB-2) and Cluster bean (Vijaydurga) were used for intercropping with maize. The every treatment consisted of two rows of above mentioned intercrops after every one row of Maize i.e. 1:2 ratios, sowing was done at a time during first fortnight of July, 2012. All agronomic practices from sowing to harvesting were followed, without any plant protection measures.

In each treatment, twenty maize plants were selected and tagged diagonally for recording the observations on major three insect pests i.e. Shoot bug (*Peregrinis maidis* Ashmead), Sugarcane leaf hopper (*Dietyophora pallida*), Aphid (*Rophalosiphum maidis* Fitch) at 15 days interval starting from 10 DAS.

RESULTS AND DISCUSSION

1 Shoot bug (*Peregrinis maidis* Ashmead)

The lowest mean number of shoot bug of 0.92 per plant was recorded on maize grown along with field bean. The next lower population was recorded in maize + cluster bean (1.02/plant) and maize + ground nut (1.04/plant). Maize + cowpea

Table 1. Population of shoot bug (*Peregrinis maidis* Ashmead) recorded in different intercropping systems with maize grown in *kharif* .

Treatments	Mean number per plant						
	15DAS	30DAS	45DAS	60DAS	75DAS	90DAS	Mean
T1 (Maize alone)	0.20 (1.10)[a]	0.90 (1.38)[ab]	1.52 (1.59)	2.02 (1.74)	2.13 (1.77)[a]	1.08 (1.44)[a]	1.31 (1.52)[ab]
T2 (Maize + Black gram)	0.25 (1.12)[a]	0.69 (1.30)[ab]	1.22 (1.49)	1.38 (1.54)	1.88 (1.70)[ab]	0.91 (1.38)[a]	1.06 (1.43)[bc]
T3 (Maize + Green gram)	0.25 (1.12)[a]	0.87 (1.37)[ab]	1.34 (1.53)	1.47 (1.57)	1.72 (1.65)[abc]	0.94 (1.39)[a]	1.10 (1.45)[bc]
T4 (Maize + Cowpea)	0.37 (1.17)[a]	1.16 (1.47)[a]	2.49 (1.87)	2.03 (1.74)	2.14 (1.77)[a]	1.09 (1.45)[a]	1.55 (1.60)[a]
T5 (Maize + Groundnut)	0.13 (1.06)[a]	0.52 (1.23)[b]	1.36 (1.53)	2.00 (1.73)	1.70 (1.64)[abc]	0.52 (1.23)[b]	1.04 (1.43)[bc]
T6 (Maize + Cluster bean)	0.17 (1.08)[a]	0.68 (1.29)[ab]	1.83 (1.68)	1.62 (1.62)	1.49 (1.58)[bc]	0.34 (1.16)[b]	1.02 (1.42)[bc]
T7 (Maize + Field bean)	0.13 (1.06)[a]	0.53 (1.23)[b]	1.36 (1.54)	1.73 (1.65)	1.39 (1.55)[c]	0.41 (1.19)[b]	0.92 (1.39)[c]
Trt Mean	0.21 (1.10)	0.76 (1.33)	1.59 (1.61)	1.75 (1.66)	1.78 (1.67)	0.76 (1.33)[b]	1.14 (1.46)
SEm±	0.08	0.08	0.09	0.07	0.05	0.05	0.04
CD @ 0.05%	0.24	0.23	0.20	0.12	0.15	0.14	0.11

Graph 1. Distribution of shoot bug.

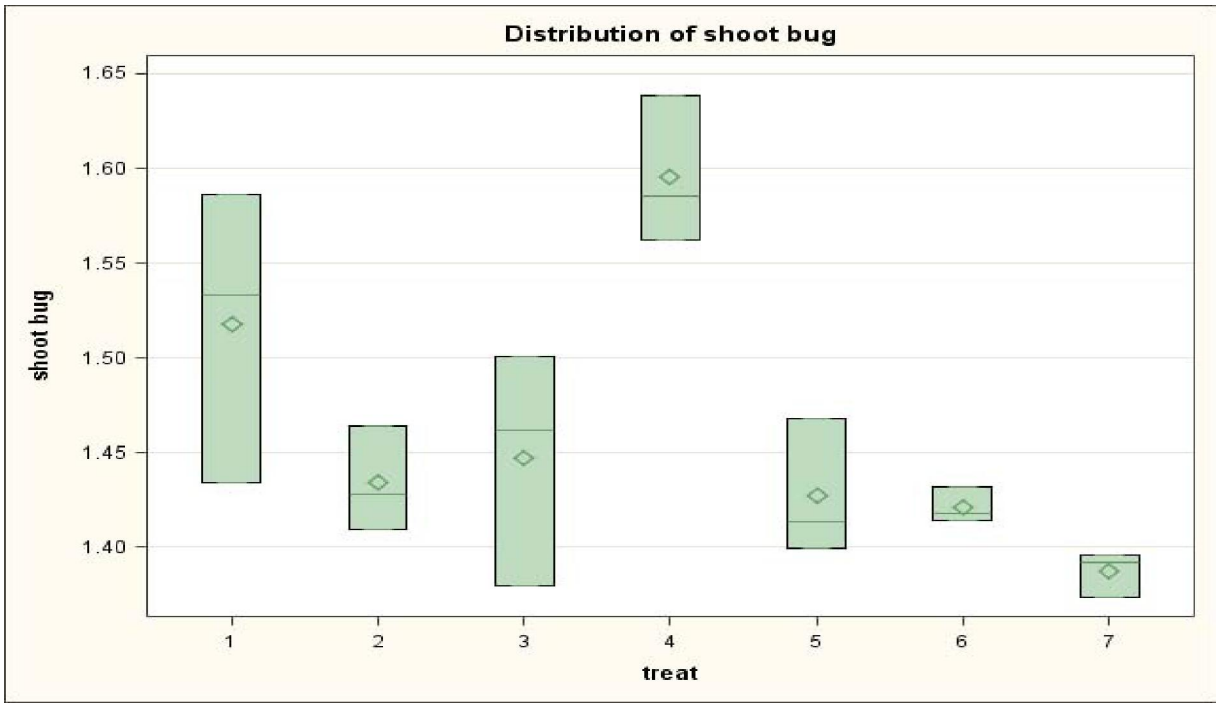

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Table 2. Population of sugarcane leaf hopper (*Dietyophora pallida*) in *kharif* maize grown in different intercropping systems

Treatments	Mean number per plant						
	15DAS	30DAS	45DAS	60DAS	75DAS	90DAS	Mean
T1 (Maize alone)	0.08 (1.04)^{a}	0.58 (1.26)^{ab}	0.88 (1.37)^{ab}	1.07 (1.44)^{a}	1.12 (1.45)^{a}	1.12 (1.45)^{a}	0.81 (1.34)^{ab}
T2 (Maize + Black gram)	0.10 (1.05)^{a}	0.65 (1.28)^{ab}	0.72 (1.31)^{b}	1.17 (1.47)^{a}	1.13 (1.46)^{a}	1.08 (1.44)^{a}	0.81 (1.34)^{ab}
T3 (Maize + Green gram)	0.10 (1.05)^{a}	0.72 (1.31)^{ab}	1.00 (1.41)^{ab}	1.20 (1.48)^{a}	1.27 (1.51)^{a}	0.95 (1.40)^{a}	0.87 (1.37)^{ab}
T4 (Maize + Cowpea)	0.08 (1.04)^{a}	0.77 (1.33)^{a}	0.88 (1.37)^{ab}	1.20 (1.48)^{a}	1.33 (1.53)^{a}	1.38 (1.54)^{a}	0.94 (1.39)^{a}
T5 (Maize + Groundnut)	0.00 (1.00)^{a}	0.27 (1.13)^{c}	0.80 (1.34)^{ab}	0.98 (1.41)^{a}	0.87 (1.37)^{a}	0.85 (1.36)^{a}	0.63 (1.28)^{ab}
T6 (Maize + Cluster bean)	0.02 (1.01)^{a}	0.22 (1.10)^{c}	0.77 (1.33)^{ab}	0.92 (1.38)^{a}	1.07 (1.44)^{a}	0.70 (1.30)^{a}	0.61 (1.27)^{b}
T7 (Maize + Field bean)	0.03 (1.02)^{a}	0.40 (1.18)^{bc}	1.28 (1.51)^{a}	1.32 (1.52)^{a}	0.98 (1.41)^{a}	1.00 (1.41)^{a}	0.84 (1.36)^{ab}
Trt Mean	0.06 (1.03)^{a}	0.51 (1.23)	0.90 (1.38)	1.12 (1.46)	1.11 (1.45)^{a}	1.01 (1.42)	0.79 (1.34)
SEm±	0.35	0.34	0.43	0.49	0.57	0.56	0.04
CD @ 0.05%	1.01	0.98	1.23	1.41	1.62	1.60	0.12

Graph 2. Distribution of sugarcane leaf hopper.

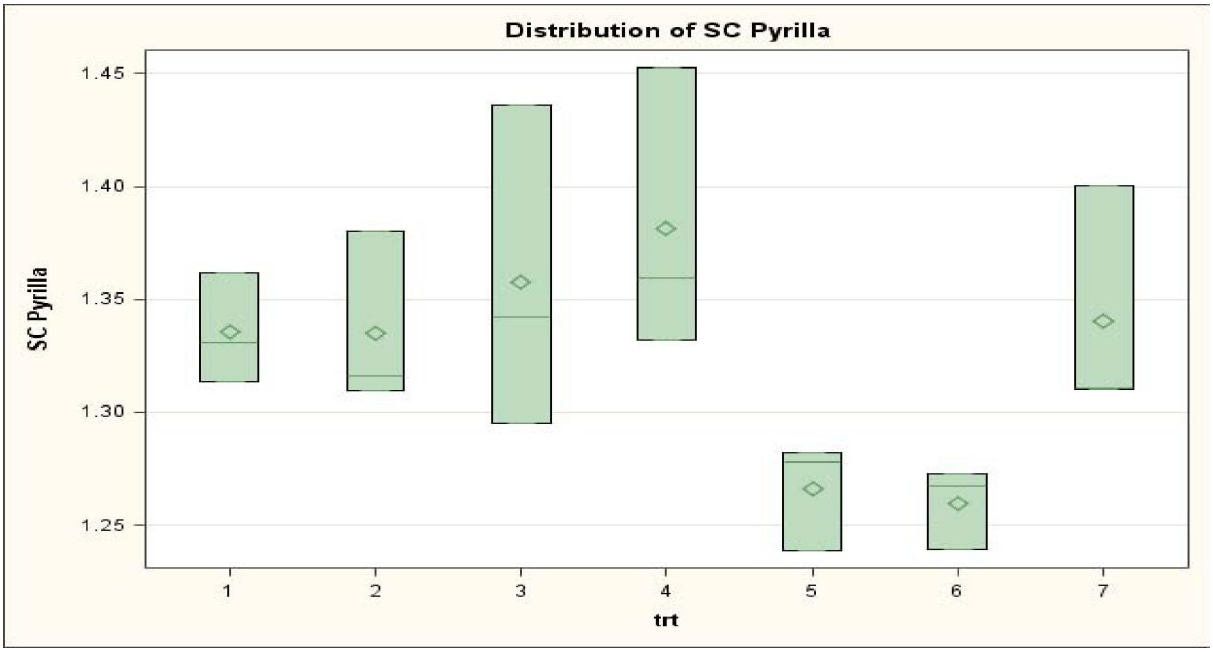

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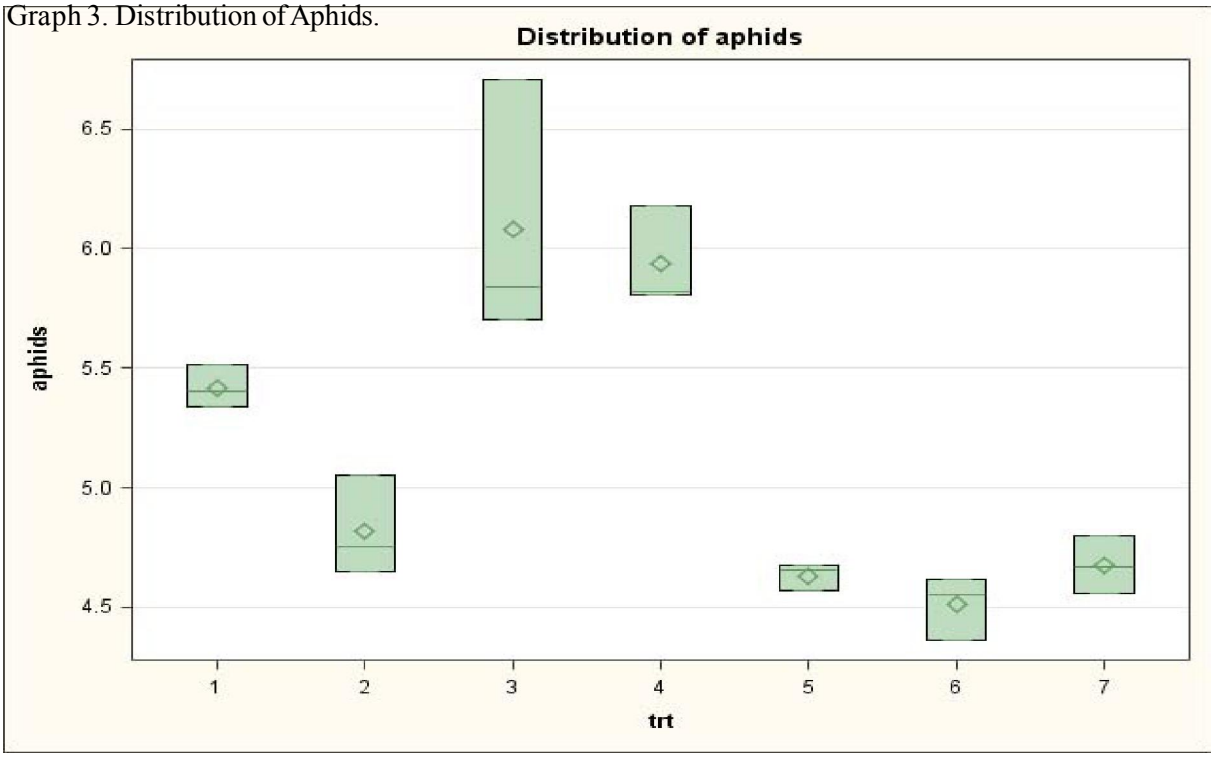
Table 3. Population of aphids (*Rophalosiphum maidis* Fitch) in *kharif* maize grown in different intercropping systems.

Treatments	Mean number per plant			
	15DAS	60DAS	75DAS	Mean
T1 (Maize alone)	22.35 (4.83)^{b}	38.56 (6.29)^{ab}	25.43 (5.14)^{abc}	28.78 (5.46)^{ab}
T2 (Maize + Black gram)	13.15 (3.76)^{c}	38.58 (6.29)^{ab}	18.49 (4.41)^{d}	23.41 (4.94)^{bc}
T3 (Maize + Green gram)	28.52 (5.43)^{a}	57.27 (7.63)^{a}	27.08 (5.30)^{ab}	37.62 (6.21)^{a}
T4 (Maize + Cowpea)	26.52 (5.25)^{ab}	47.84 (6.99)^{a}	30.22 (5.59)^{a}	34.86 (5.99)^{a}
T5 (Maize + Groundnut)	19.33 (4.51)^{bc}	21.11 (4.70)^{bc}	20.97 (4.69)^{cd}	20.47 (4.63)^{c}
T6 (Maize + Cluster bean)	19.77 (4.56)^{b}	19.61 (4.54)^{c}	18.79 (4.45)^{d}	19.39 (4.52)^{c}
T7 (Maize + Field bean)	16.18 (4.15)^{c}	22.57 (4.85)^{bc}	24.29 (5.03)^{bc}	21.01 (4.69)^{c}
Trt Mean	20.83 (4.67)	35.08 (6.01)	23.61 (4.96)	26.51 (5.24)
SEm±	0.11	0.61	0.17	0.25
CD @ 0.05%	0.31	1.74	0.48	0.71

Graph 3. Distribution of Aphids.



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intercropping system had significantly higher shoot bugs (1.55 bugs/plant) followed by maize alone. The population was gradually increased up to 75 days (Peak for ex. 2.14 bugs/plant in Maize + cowpea) and started to decline thereafter. (Table 1 and Graph 1)

2 Sugarcane leaf hopper (*Dietyophora pallida*)

Sugarcane leaf hopper damage started from 4-5 leaf stage of maize plant. Out of all intercropping systems maize along with cluster bean recorded less number of leaf hoppers (0.61/ plant) and it is followed by maize along with ground nut system (0.63/ plant). (Table 2 and Graph 2) Highest number of leaf hoppers recorded in maize + cowpea system (0.94/plant) followed by maize along with green gram (0.87/plant). Sugarcane leaf hopper attack was observed throughout crop. Pest population started increasing gradually from 15 DAS to 75 DAS and then declined. Treatment wise mean distribution of sugarcane leaf hopper was shown in Graph 2

3 Aphid (*Rophalosiphum maidis* Fitch)

Aphid incidence was not noticed up to 35 days but afterward its incidence was dominantly recorded and aphid population reached peak at 60 DAS i.e. 57.27 per plant in Maize + green gram. Aphids were observed to prefer tassels. Lowest numbers of aphids were found in maize + cluster bean intercropping system (19.39/plant) followed by maize + ground nut (20.47/plant) and maize + field bean (21.01/plant). Maize + green gram and maize + cowpea suffered from higher population of aphids.

Field bean, cluster bean and groundnut were observed to grow luxuriantly and might have played a role in obstructing the movement of all the three sucking pests. Whereas cowpea and green gram were poorly grown due to severe attack by *Aphis craccivora*. Due to their poor growth they might have not efficiently obstructed the pest passage. In addition, higher coccinellid fauna of field bean and groundnut also might have reduced the sucking pests of maize. The literature available related to the present results are furnished hereunder,

Srinivas Rao (2007) noticed that coccinellids were significantly more abundant in pigeon pea with sorghum or green gram or groundnut systems. Kennedy *et al.* (1994) studied the insect pests in a pure stand of groundnut crop and in different groundnut-based cropping systems. The incidence of pests was minimum in groundnut with intercrops.

According to Atiyeh *et al*. (1996) the aphid population was significantly higher at the silk stage (8.29 aphids /leaf) on maize in Pakistan. Lutfallah *et al*. (1993) recorded high infestation of *R. maidis* in the tasselling stage during the pollination period.

Panwar *et al* (1993) reported that sugarcane leaf hopper causes serious damage to rainy season maize during August to October in India.

Maize + Cluster bean, Maize + Groundnut and Maize + field bean intercropping systems were found suitable as they unfavour the insect pests of maize that leads to higher return. Jioa *et al.* (2008) found maize + ground nut intercropping enhanced the efficient utilization of strong light by maize and weak light by resulting in higher yields.

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