Influence of Associate Crop (African marigold - *Tagetes spp.*) on Insect Pest Infestation, Growth and Yield of Cucumber (*Cucumis sativus)*

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ABSTRACT

Cucumber (*Cucumis sativus)* is susceptible to serious losses from pests which may result in 40-50% loss. The research therefore investigated the influence of associate crop (Marigold) on insect pest infestation, growth and yield of Cucumber (*Cucumis sativus)*. The treatments were marigold at the edge row, marigold between the rows and control without marigold. Treatments were arranged in a randomised complete block design (RCBD).The soil chemical properties were analysed before the experiment. Data were collected on vine length, number of leaves, leaf area, insect pest severity and number of cucumber fruit. Data obtained were subjected to analysis of variance (ANOVA) at p = 0.05. Means were separated using Duncan Multiple Range Test (DMRT). Significant increase was observed in number of leaves among the treatments. Treatment with marigold in between rows had the highest numbers of leaves (54) followed by plots with marigold at edge rows (45) and the control (35). Fruit yield of cucumber with Marigold between rows had significantly higher fruit yield compared to other treatments. A similar trend was observed on the effects of marigold on the vine length. Insect damage was less severe on plants with marigold in between rows compared to other treatments.

Keywords: Marigold, insect pest infestation, growth and yield, Cucumber.

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INTRODUCTION

Cucumber C*ucumis sativus*) is a member of the Cucurbitacea family. It is native to Asia and Africa where it has been consumed for the past 30,000 years (Wehner and Guner, 2004). It is an annual crop with tendrils and hairy leaves, creeping vine that grows up trellis or other supporting frames wrapping around supports with thin spiral tendrils. The plant has large leaves that form a canopy over the fruit. The fruit is roughly cylindrical, elongated with tapered ends and may be as long as 60cm long and 10cm diameter, having an enclosed seed, botanically speaking, Cucumbers are classified as accessory fruits much like tomatoes and squash they are prepared and eaten as vegetable. Cucumbers are usually more than 90 % water (Eifediyi and Renuison, 2010). Optimum growth occur between 20-25°C with growth reduction occurring below 16°C and above 30°C. It is popular fresh market vegetable in salad (Plader*et al*., 2007). Cucumber can germinate in 3 to 7 days, if temperatures are at optimum levels. Flowering starts 40 - 45 days after sowing, it should be ready for harvest in approximately 50-70 days. In Nigeria over 60% of local production is from the northern part of Nigeria such as Kano, Adamawa, and Nasarawa. Globally China is the highest producer of cucumber exporting 2500 tonnes of Cucumber to the global market. The crop is susceptible to serious losses from pests and diseases such as white fly, the melon fly, leaf miners, mosaic virus, nematodes, worms and ants (Evenhuis et al., 2004). Comprehensive approach to pest control using combine means to reduce the status of pests to tolerable level while maintaining a quality environment is essential for optimum yield and profit. High temperature and high humidity of the rainy season encourages pests and disease attack. The optimization of pest control in economic and ecological manner by coordinated use of multiple tactics to ensure stable cucumber production and to maintain pest damage below economic injury level minimising risks to man and the environment is important (Grubben and Denton, 2004).There are many varieties of marigold that repel pests and can be cultivated with crops such as cucumber to control pests. The use of marigold is not implemented in isolation from other management activities rather it is one of the components of the modern crop production system of physical and biological management all

interacting to determine the yield of cultivated crop. The use of marigold is economical and environmentally friendly, marigold repels pests, which reduces their activity (damages) and the cost of pest control, and this will eventually result to increase in cucumber production in Nigeria. This research therefore investigates the effects of associate crop on pest infestation growth and yield of cucumber *Cucumis sativus.*

MATERIALS AND METHODS

Field experiment was conducted at the Organic garden of Federal University, Oye-Ekiti. The rainfall regime is bimodal with very short break in August The pre-planting soil analysis was done to determine the soil nutrient status. The soil of the area belongs to the broadly group of ferruginous top soil. The soil physical and chemical analysis was conducted before planting. Predominant weeds observed in the farm include elephants grass, sida weed, calapogonium, goat weed, carpet weed and mucuna, The plot was cleared manually using cutlass, the trashes were packed and land was tilled and beds of 3m by 2m was prepared across the slope.

The experimental design was randomised complete block design (RCBD) replicated 3 times. The treatments were Cucumber with marigold, Cucumber without marigold and control. Weeding was done manually at 3-week interval. Cucumber was cultivated organically and data were collected on insect pest severity on a hedonic scale of 1-7, the vine length, number of leaves , number of fruits and fresh fruit weight at two weeks interval and the data collected were analysed using analysis of variance (ANOVA). Means were separated using Duncan's multiple range test (DMRT) at 5% probability level.

RESULTS

The result of the soil analysis for the experimental site were presented in Table 1, which gave particle size for sand as 819.30g kg^{-1}, silt as 111.8g kg^{-1} and clay as 68.90g kg^{-1}. The pH of the soil was 6.07; organic carbon content was 1.80%. Exchangeable acidity was 0.11 cmol kg^{-1} while total N and

available P were 0.25% and 5.60 mg kg^{-1} respectively. Significant increase was observed in number of leaves among the treatments (table. 2). Treatment with marigold in between rows had the highest numbers of leaves (54) followed by plots with marigold at edge rows (45) and then the control (35). The vine length of a plant is an important growth index directly linked with the productive potential of plant in terms of vegetative growth and fruit yield. Significant increase was observed among the treatments (table 4). Treatment with marigold in between rows had the longest vine length (49.3) followed by plots with marigold at edge rows (48.3) and then the control (44.5)

Fruit number of cucumber with Marigold between rows had significantly higher fruit number compared to other treatments. A similar trend was observed on the effects of marigold on the vine length. Insect damage was less severe on plants with marigold in between rows compared to other treatments.

Table 1: Physico-chemical properties of soil before planting.

pH (H_20) 1.1	6.07
Total Nitrogen g/Kg	0.25
Organic carbon g/Kg	1.80
Available P mg/Kg	5.60
Exchangeable cations cmol/Kg	
Ca	3.80
Mg	2.50
K	0.30
Exchangeable acidity cmo/Kg	0.11
Exchangeable micronutrients mg/Kg	
Fe	6.4
Zn	2.5
Cu	3.7
Base saturation g/Kg	980
Sand g/Kg	819.3
Silt g/Kg	111.8
Clay g/Kg	68.9

Table 2: Mean Number of Leaf of cucumber as influenced by Marigold

	Weeks after planting									
TREATMENTS	3	4	5	6	7	8	9	10	11	12
Marigold at edge rows	5a	6a	9a	13a	17b	25b	30b	35b	39b	45b
Marigold between rows	6a	9b	14b	17b	22c	28c	34c	39c	44c	54c
Control	4a	5a	7a	12a	14a	16a	20a	25a	28a	35a

Means with the same letter in same columns are not significantly different from each other by Duncan Multiple Range Test (DMRT) at P = 0.05

Table 3: Leaf area of cucumber as influenced by Marigold

TREATMENTS	4 WAP	6 WAP	8 WAP	10 WAP	12 WAP	14 WAP
Marigold at edge of row	3.43b	5.06a	6.50ab	8.83b	12.33b	14.75b
Marigold between row	4.16a	5.50a	7.33a	10.66a	15.66a	20.64a
Control	3.03c	4.00a	5.46c	7.33c	10.66c	9.05c

Means with the same letter in same columns are not significantly different from each other by Duncan Multiple Range Test (DMRT)at P<0.05

Table 4: Vine length (cm) of cucumber as influenced by Marigold

TREATMENTS	3 WAP	4 WAP	5 WAP	6 WAP	7 WAP	8 WAP
Marigold at edge row	6.00a	39.66ab	31.76ab	30.00a	34.66a	48.33b
Marigold between row	56.33a	55.33b	56.16b	27.33b	39.66a	49.93c
Control	29.33a	22.00a	22.53a	21.33a	32.66a	44.45a

Means with the same letter in same columns are not significantly different from each other by DMR at P=0.05

Table 5: Effect of Marigold as associate crop on insect pest severity in Cucumber

	Weeks After Planting				
Treatments	2	4	6	8	10
Marigold between rows	4a	5a	5a	6a	7a
Marigold at edge row	3b	4b	4b	4b	4b
Control	2c	3c	3c	4c	4c

Insect severity score of 1 to 4: where 1= high infestation, 2 = moderate infestation, 3 = very slight infestation and 4 = No infestation.

DISCUSSION

Total Nitrogen is adequate compared with critical levels of 0.15% for Nitrogen recommended by Agboola and Corey (1973) while available P content was very low compared with critical levels range of 10-12 mg kg^{-1} for available P obtained for soils in Southwestern Nigeria. Using the critical levels of 0.16 - 0.20 cmol kg^{-1}. The exchangeable bases (K, Ca and Mg) were adequate (Sobulo and Osiname, 1981). The soil is sandy loam and slightly

acidic. Significant increase was observed in number of leaves among the treatments Treatment with marigold in between rows had the highest numbers of leaves (54) followed by plots with marigold at edge rows (45) and then the control (35). The vine length of a plant is an important growth index directly linked with the productive potential of plant in terms of vegetative growth and fruit yield. An optimum vine length is claimed to be positively correlated with productivity of plant. Significant increase was observed among the treatments Treatment with marigold in between rows had the longest vine length (49.3) followed by plots with marigold at edge rows (48.3) and then the control (44.5). Fruit number of cucumber with Marigold between rows had significantly higher fruit number compared to other treatments. A similar trend was observed on the effects of marigold on the vine length. Insect damage was less severe on plants with marigold in between rows compared to other treatments. African marigolds (Tagetes spp.) produce root exudates which can be absorbed by neighboring plants thereby reducing pest numbers and enhancing yield (Matsumoto and Kotulai, 2002). Companion plants which provide no economic return are useful when their economic benefit in increased yield of the target crop exceeds the cost of growing the companion (Altieri M A, 1999, Hokkanen H M T, 1991) The use of simple and diverse trap crops to control the crucifer flea beetle (*Phyllotreta cruciferae* Goeze) in broccoli (*Brassica oleracea* L. var. *italica*) was explored. The trap crops included monocultures and polycultures of two or three species of Pacific gold mustard (*Brassica juncea* L.), pac choi (*Brassica rapa* L. subsp. *pekinensis*) and rape (*Brassica napus* L.). The results indicated that broccoli planted adjacent to diverse trap crops containing all three trap crop species attained the greatest dry weight which implied that the trap crops species were not particularly effective when planted alone but provided substantial plant protection when planted in multispecies polycultures. The diverse trap crops consisting of all three trap crop species (Pacific gold mustard, pac choi and rape) provided the most effective trap crop mixture. The success of trap crops depends on a number of variables, such as the physical layout of the trap crop (e.g., size, shape, location) and the pests' patterns of movement behavior (Hoy *et al.,* 2000). Perimeter trap crops sown around the border of the main crop have been used to disrupt

Colorado potato beetle (*Leptinotarsa decemlineata* Say) colonization of potato fields. A perimeter trap crop may not impede pest movement, if the pest descends on a crop from high elevations. Hokkanen (1991) has recommended an area of about 10% of the main crop area be devoted to the trap.

CONCLUSION

The experiment revealed that the best result in growth and yield of *Cucumis sativus* was observed for Cucumber planted with Marigold in between rows. Insect damage was less severe on plants with marigold in between rows compared to other treatments

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