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Management of Sweet Potato Weevil Through Sweet Potato (Ipomoea Batatas (L.) Lam.) + Marigold (Tagetes Patula, T Erecta) Intercropping

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ABSTRACT

An investigation was carried out during rabi 2011-12 to study the management of Sweet potato weevil through intercropping of marigold in sweet potato (*Ipomoea batatas* (L). Lam) at Horticultural Research cum Instructional Farm, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.). The experiment was laid out in randomized block design (RBD) with three replications and eleven treatment combinations. On the basis at findings, it may be inferred, that Sweet potato + Marigold African type 1:1 row ratio (T4) was significantly superior to others in the higher production of highest marketable tuber yield (14.88 t ha^{-1}) and lowest % of weevil damaged tubers (24.09%). while in sole crop Sweet potato (T1) 12.09 t ha^{-1} of marketable tuber yield and 45.96 % of weevil damaged tubers was recorded.

Key words : Marketable tuber yield, Sweet potato weevil, Weevil damaged tuber yield.

The Sweet potato is regarded as the most important root or tuber crop of the tropics and play an important role in the economy of poor households (Nath et al., 2007). In India the major Sweet potato growing states are Orissa, Bihar, U.P, M.P and Chhattisgarh. Recently decreasing the production of sweet potato in India as well as in Chhattisgarh due to many constraints. Among the biotic constraints the sweet potato weevils (*Cylas formicarius*) was the most devastating insect pest of the crop worldwide causing economic damage when the weather is dry (Bourke, 1985). Sweet potato weevils are responsible for lower yields and marketable tubers. Tuber damage by weevils can reach up to 90% and relatively minor damage can both reduce yield and render infested tubers unmarketable owing to the presence of feeding marks and oviposition holes (Sutherland, 1986; Korada et al., 2010). Other deleterious symptoms are offensive odours due to the presence of terpenes produced by the insects (Sato et al., 1981) and to a raised level of phenolic compounds (Padmaja and Rajamma, 1982). According to Singh (2010) in Chhattisgarh the sweet potato damaged 40% tubers by the incidence of sweet potato weevil. Chemical control of this insect pest is very costlier and not much effective. Therefore, through cultural practices it can be reduced and gain tuber yield and quality can be achieved.

MATERIAL AND METHODS

A field experiment was conducted at Horticulture Research cum Instructional farm, Department of Horticulture, Indira Gandhi Krishi Vishwavidyalaya, Raipur (C.G.) during 2011-12 to study on management of Sweet potato weevil through intercropping of Marigold in Sweet Potato (*Ipomoea batatas* (L). Lam) under Agro-climatic conditions of Chhattisgarh plains. The soil of the experimental field was sandy-loam in texture (*Inceptisols*) having the pH 7.5. The experiment was laid out in a Randomized Block Design (RBD) with three replications. The treatment consisted of 11 Sweet potato + Marigold intercropping viz. The simultaneous planting done for both inter crop as well as main crop at January 5, 2012. The Sweet potato vine cuttings (25 cm) were planted on ridges with vertical planting and a position of cutting lies above the ground with a spacing of 20 cm between two plants. The Marigold seedlings (30 Days aged) were planted on both sides of a ridge, one side of a ridge and on ridge with spacing of 20 cm and 10 cm on the basis of treatment. Fertilizers applied at 100% RDF for both intercrop as well as main crop. Recommended dose of NPK to sweet potato was 75:50:75 kg ha^{-1} and for marigold 80:40:40 kg ha^{-1}. Proper intercultural operations like weeding, gap filling, watering and earthing up are taken in timely. The Sweet potato crop was harvested when it was

Table 1. Effect of Sweet potato + Marigold intercropping on total tuber yield (t ha^{-1}), weevil damaged tuber yield(t ha^{-1}), % of Weevil damaged tuber, and marketable tuber yield of Sweet potato .

	Treatment	Total tuber yield of sweet potato (t ha^{-1})	Weevil damaged tubers yield of Sweet potato (t ha^{-1})	% of weevil damaged tubers of Sweet potato	Marketable tuber yield of Sweet potato(t ha^{-1})
T1-	Sole crop sweet potato	22.38	10.29	45.96	12.09
T2-	Sole crop marigold (African type)	-	-	-	-
T3-	Sole crop marigold (French type)	-	-	-	-
T4-	Sweet potato + Marigold (African type) 1:1 Row ratio	19.60	4.72	24.09	14.88
T5-	Sweet potato + Marigold (African type) 1:2 Row ratio	10.43	3.65	35.04	6.77
T6-	Sweet potato + Marigold (French type) 1:1 Row ratio	23.12	9.91	42.86	13.21
T7-	Sweet potato + Marigold (French type) 1:2 Row ratio	19.44	6.25	32.13	13.19
T8-	Sweet potato + Marigold (African type) alternate planting on ridge(20 cm spacing)	15.02	4.38	29.15	10.64
T9-	Sweet potato + Marigold (French type) alternate planting on ridge(20 cm spacing)	18.06	6.09	33.71	11.97
T10-	Sweet potato + Marigold (African type) alternate planting on ridge(10 cm spacing)	13.49	5.45	40.40	8.04
T11-	Sweet potato +Marigold (French type) alternate planting on ridge (10cm spacing)	19.28	8.33	43.23	10.95
	SEm±	0.85	0.57	-	0.82
	CD (P=0.05)	2.55	1.71	-	2.47
	CV%	8.21	15	-	12.62

fully matured i.e. 120 DAP. Total tuber yield t ha^{-1}, weevil damaged tuber yield t ha^{-1} and marketable tuber yield t ha^{-1}; observations were recorded at the time of harvesting.

RESULTS AND DISCUSSION

Total tuber yield (t ha^{-1}):

The highest total tubers yield (23.12 t ha^{-1}) was recorded in Sweet potato + Marigold French type 1:1 row ratio (T6) which was significantly superior over others, but it was at par to sole crop Sweet potato (T1) (22.38 t ha^{-1}). Significantly the lowest total tuber yield (10.43t ha^{-1}) was noted in Sweet potato + Marigold African type 1:2 row ratio (T5). The Sweet potato + Marigold French type intercropping combinations shows a considerably better total tuber yields over Sweet potato + Marigold African type intercropping combinations (Table 1). Similar results were also obtained by Evangelio and Rosario (1981) who recorded the production of 21.99 t sweet potato ha^{-1} under intercropping system. Sauti *et al*. (2004) reported higher sweet potato production in intercropping system than sole crop. Anonymous (2010) at Bagalkot, noted higher total tuber yield in intercropping system than sole Sweet potato crop.

Table 2. Effect of Sweet potato + Marigold on LER, ATER, Sp-EY (kg ha^{-1}) & % Increase in yield over sole sweet potato.

	Treatment	LER	ATER	SP-EY (kg ha^{-1})	% increased in yield over sole Sp
T1-	Sole crop sweet potato	1	1	12093	-
T2-	Sole crop marigold (African type)	1	1	9221	-23.75
T3-	Sole crop marigold (French type)	1	1	6464	-46.55
T4-	Sweet potato + Marigold (African type) 1:1 Row ratio	1.44	1.42	20122	66.39
T5-	Sweet potato + Marigold (African type) 1:2 Row ratio	1.28	1.25	14318	18.40
T6-	Sweet potato + Marigold (French type) 1:1 Row ratio	1.55	1.53	16540	36.77
T7-	Sweet potato + Marigold (French type) 1:2 Row ratio	1.61	1.58	17967	48.57
T8-	Sweet potato + Marigold (African type) alternate planting on ridge(20 cm spacing)	1.02	1.01	13859	14.62
T9-	Sweet potato + Marigold (French type) alternate planting on ridge(20 cm spacing)	1.05	1.04	13557	12.11
T10-	Sweet potato + Marigold (African type) alternate planting on ridge(10 cm spacing)	1.22	1.19	13701	13.30
T11-	Sweet potato +Marigold (French type) alternate planting on ridge (10cm spacing)	1.30	1.28	13751	12.88
Selling Rate kg^{-1}		Sweet potato – Rs.10/-		Marigold – Rs. 10/-	

Weevil damaged tuber yield (t ha^{-1}) and % of weevil damaged tuber of Sweet potato

The findings reveal that significantly highest weevil damaged tuber yield (10.29 t ha^{-1}) and percentage of weevil damaged tubers (45.96%) was recorded in sole crop Sweet potato (T1), which was significantly higher over other treatments, but it was at par to Sweet potato + Marigold French type 1:1 row ratio (T6) (9.92 t ha^{-1} & 42.88%). Significantly the lowest weevil damaged tuber yield (3.65 t ha^{-1}) was recorded in Sweet potato + Marigold African type 1:2 row ratio (T5); however, the lowest percentage (24.09 %) of weevil damaged tubers was noted in Sweet potato + Marigold African type 1:1 row ratio (T4) (Table 1).It can be noted from the above finding that the lower weevil damaged tuber yield was recorded in Sweet potato + Marigold African type intercropping treatment combinations as compared to Sweet potato + Marigold French type intercropping treatment combinations and sole crop Sweet potato. The present result was in conformity with the finding obtained by Anonymous (2011) at Dapoli, who reported that tuber infestation due to sweet potato weevil varied significantly from 18.82 to 37.81 per cent among different barrier crops as against 43.61 per cent in control (sole sweet potato crop). Anonymous (2010) reported at Bagalkot, that tuber weevil infestation varied significantly from 17.31 to 37.16 per cent among different barrier crops as against 37.50 per cent in control (sole sweet potato crop) and Singh (2010) reported that in Chhattisgarh, the sweet potato damage was 40% tubers by the incidence of weevil.

Table 3.Effect of Sweet potato + Marigold intercropping on Economic evaluation of the Treatment.

	Treatment	Cost of cultivation (Rs ha^{-1})	Gross income (Rs ha^{-1})	Net profit (Rs ha^{-1})	B:C ratio
T1-	Sole crop sweet potato	47553	120930	73377	1.54
T2-	Sole crop marigold (African type)	50809	92210	41401	0.81
T3-	Sole crop marigold (French type)	50809	64640	13831	0.27
T4-	Sweet potato + Marigold (African type) 1:1 Row ratio	63007	201220	138213	2.20
T5-	Sweet potato + Marigold (African type) 1:2 Row ratio	76622	143180	66558	0.87
T6-	Sweet potato + Marigold (French type) 1:1 Row ratio	63007	165400	102393	1.63
T7-	Sweet potato + Marigold (French type) 1:2 Row ratio	76622	179670	103048	1.35
T8-	Sweet potato + Marigold (African type) alternate planting on ridge(20 cm spacing)	50827	138590	87763	1.73
T9-	Sweet potato + Marigold (French type) alternate planting on ridge(20 cm spacing)	50827	135570	84743	1.67
T10-	Sweet potato + Marigold (African type) alternate planting on ridge(10 cm spacing)	63007	137010	74003	1.17
T11-	Sweet potato +Marigold (French type) alternate planting on ridge (10cm spacing)	63007	137510	74853	1.18

Selling Rate kg^{-1} Sweet potato – Rs.10/- Marigold – Rs. 10/-

Marketable tuber yield (t ha^{-1}):

Marketable tuber yield (14.88 t ha^{-1}) was recorded in Sweet potato + Marigold African type 1:1 row ratio (T4), which was significantly superior over others. Significantly the lowest marketable tuber yield (6.77 t ha^{-1}) was recorded in Sweet potato + Marigold African type 1:2 row ratio (T5) (Table 1). Above finding under the study are in close proximity with the finding of Anonymous (2011), who observed the alternate row (1:1) with marigold was reasonably better than the planting in 2:1 fashion and the combination with sweet potato and marigold was found better than other treatments where the marketable root yield was recorded high. Anonymous (2010) observed 11.7 t ha^{-1} of marketable tuber yield in sole crop sweet potato.

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