Screening of sweet potato genotypes against sweet potato weevil (*Cylas formicarius*)

ABSTRACT

Field screening of 51 sweet potato genotype against sweet potato weevil was conducted at AICRP on tuber crop, Vegetable Research Centre, Regional Horticultural Research and Extension Centre (RHREC), Dharwad during rabi, 2019-20 and 2020-21 (two seasons) The treatments in each replication were allotted randomly by using random number table. Sweet potato cuttings which have 2-3 buds were planted in each replication with 3 m × 3 m plot size at 60 cm × 20 cm spacing. The crop was raised by following the recommended package of practices of University of Horticultural Sciences, Bagalkot. The lowest weevil incident were observed in the 5 sweet potato genotypes, among these genotypes four genotypes *viz.*, BSP-1, BSP-26, BSP-27, BSP-32 are good yield compare to check (Sree Bhadra) these four genotypes are considered for future research work and for commercial cultivation.

Key words: Treatments; Tuber crop; Cuttings; Resistant; Tolerant.

1. INTRODUCTION

"Sweet potato [*Ipomoea batatas* (L.) Lam.] is an important tuber crop of tropical and sub-tropical regions of the world and it forms the sixth most important food crop after rice, wheat, potato, maize and cassava. It is native to South America and it belongs to the family *Convolvulaceae.* The family includes 55 genera and contains more than 1000 species" (Watson and Dallwitz, 2000). "It is popularly known as *'white potato'* or *'Irish potato'* in southern part of United States of America, while in India it is commonly called as *sakar kand*. The total area of sweet potato in the world is about 77 lakh hectares with a production of 918 lakh tonnes and productivity is 11.92 t ha^{-1}. China is the leading producer of sweet potato in the world followed by Nigeria and Uganda. India is at 9^{th} position in production" (Anon., 2019a). "In India it is cultivated in an area of 1.07 lakh hectares with a production of 11.10 lakh tonnes" (Anon., 2022). "The major states cultivating this crop in India are Orissa, West Bengal, Bihar, Uttar Pradesh, Madhya Pradesh, Maharashtra and Karnataka. Orissa being the leading state in area and production followed by West Bengal and Uttar Pradesh, while Andhra Pradesh hold the record for highest productivity" (Anon., 2019c). "In Karnataka state sweet potato is grown in an area of about 2,730 hectares with a production of 32,866 tonnes and productivity of 12.04 t ha^{-1}" (Anon., 2019b).

“In any crop, pests and diseases generally hamper growth, yield, and productivity. Particularly in sweet potatoes, the sweet potato weevil (*Cylas formicarius* (Fab.)) is known as a major devasting pest” (Smith and Beuzelin 2015; Chen 2019). “It is an Asian species but is usually found throughout the tropical regions worldwide including North America, the Caribbean, Europe, Africa, Asia, and Oceania” (Hue & Low, 2015).

Sweet potato weevils are known to cause significant harm to the entire sweet potato plant at every stage of their life cycle, ranging from the egg stage to adulthood. During the egg-laying process, female weevils create cavities and pierce the roots to deposit their eggs. These eggs are positioned beneath the root surface and covered with excrement produced by the adult females, which has a dark colour. The visual damage caused by these punctures greatly diminishes the root's attractiveness and market value, resulting in substantial economic losses (Hue & Low, 2015).

Chemical management is widely practiced for controlling the sweet potato weevil, but it is deemed environmentally hazardous. Consequently, it is highly recommended to minimize chemical pesticide use and encourage the adoption of ecologically sound control measures (Mau *et al*, 2021). Furthermore, the effectiveness of chemical control is often compromised due to the weevils' subterranean nature and their tendency to spend a significant portion of their life cycle within the roots. Hence, employing resistant or tolerant sweet potato varieties is considered a reliable and environmentally-friendly alternative for controlling the sweet potato weevil. Therefore, this study aims to assess the performance of 51 different sweet potato genotypes in terms of their resistance to the sweet potato weevil.

2. MATERIALS AND METHODS

The current study was under taken in AICRP on tuber crop, Vegetable Research Centre, Regional Horticultural Research and Extension Centre (RHREC), Dharwad during rabi, 2019-20 and 2020-21 (two seasons). Totally 51 genotypes were collected from different sources and evaluated. Geographical site of experimental fields is located in the Northern Transitional Zone (Zone VIII) of Karnataka state situated at 150 26’ North latitude, 750 07’ East longitude with an altitude of 678 m above the mean sea level. The experiment was laid out in a randomized block design (RBD) with two replications. The treatments in each replication were allotted randomly by using random number table. Sweet potato cuttings which have 2-3 buds were planted in each replication with 3 m × 3 m plot size at 60 cm × 20 cm spacing. The crop was raised by following the recommended package of practices of

University of Horticultural Sciences, Bagalkot. Polled data of 2019-20 and 2020-21 were presented in the tables.

Observation

Sweet potato weevil infestation (%)

Immediately after harvest, the numbers of tubers infested with weevil were counted and values were summed up to get a total number of tubers infested in each experimental plot. The per cent incidence of weevil under natural condition was calculated by using following formula:

$$\text{Per cent weevil incidence} = \frac{\text{Number of tubers infested}}{\text{Total number of tubers}} \times 100$$

3. RESULTS AND DISCUSSION

Per cent weevil infestation of tubers

Fifty one sweet potato genotypes were assessed for weevil infestation of tubers and data are presented in Table 1. The per cent tuber weevil infestation ranged from 21.77 to 58.53 %. The lowest weevil incidence (21.77 %) was recorded in BSP-1 which is recorded highest marketable yield *i.e.*, 47.76 t/ha in comparison to check, Sree Bhadra (50.29 %) genotype BSP-1 has 28.52 per cent lower weevil infestation. Higher weevil infestation was observed in BSP-15 (58.53 %) which is yield about 13.33 t/ha, it has 8.09 per cent more incident than Sreee Bhadra (50.29 %). The above results are comparison with Field screening of genotypes against sweet potato weevil by Prasad *et al*, (2022) and Allolli *et al* (2012).

Based on per cent weevil infestation the genotypes were grouped into four categories *viz..*, Resistant (0-10), moderately resistant (11-25), moderately susceptible (26-50) and susceptible (51-75) (Table 2). None of the genotypes exhibited complete resistance to weevil infestation. However, among the 51 genotypes, 5 genotypes were classified as moderately resistant (BSP-1, BSP-22, BSP-26, BSP-27, BSP-32), 37 genotypes (BSP-4, BSP-6, BSP-10, BSP-17, BSP-18, BSP-20, BSP-21, BSP-23, BSP-24, BSP-25, BSP-28, BSP-29, BSP-30, BSP-31, BSP-33, BSP-34, BSP-35, BSP-36, BSP-37, BSP-38, BSP-39, BSP-40, BSP-41, BSP-42, BSP-44, BSP-46, BSP-49, BSP-50, BSP-51, BSP-52, NBS-1, NBS-2, NBS-3, NBS-4, CIP-1, CIP-2, Khanapur local) were classified as moderately susceptible category, while 9 genotypes (BSP-8, BSP-15, BSP-19, BSP-43, BSP-45, BSP-47, BSP-48, ST-14, Sree Bhadra) are classified as susceptible category. Previous researchers Singh and Sharma

(2003), Padmanaban and Rai (1993), and Desai *et al* (2013) described classification of sweet potato genotypes on the basis of tuber infestation owing to C. *formicarius*.

Table 1. Per cent weevil (*Cylas formicarius)* infestation and tuber yield in sweet potato genotypes

Sl. No.	Genotypes	Weevil incidence (%)	Tuber yield (t/ha)
1	**BSP-1**	21.77	47.76
2	**BSP-4**	30.70	25.91
3	**BSP-6**	29.28	25.96
4	**BSP-8**	54.16	19.58
5	**BSP-10**	31.45	31.27
6	**BSP-15**	58.53	13.33
7	**BSP-17**	33.60	15.73
8	**BSP-18**	32.78	36.08
9	**BSP-19**	56.72	9.14
10	**BSP-20**	35.04	28.00

11	**BSP-21**	28.56	38.80
12	**BSP-22**	24.85	15.69
13	**BSP-23**	32.79	15.51
14	**BSP-24**	32.85	24.90
15	**BSP-25**	29.62	42.21
16	**BSP-26**	23.68	45.33
17	**BSP-27**	22.60	43.61
18	**BSP-28**	27.19	37.93
19	**BSP-29**	29.15	41.13
20	**BSP-30**	28.05	32.61
21	**BSP-31**	30.97	32.72
22	**BSP-32**	22.94	43.11
23	**BSP-33**	26.94	34.74
24	**BSP-34**	26.24	40.92
25	**BSP-35**	27.12	24.98
26	**BSP-36**	29.60	26.61
27	**BSP-37**	29.04	29.57
28	**BSP-38**	28.02	24.14
29	**BSP-39**	29.89	32.97
30	**BSP-40**	26.85	26.09
31	**BSP-41**	29.21	40.34
32	**BSP-42**	58.36	12.07
33	**BSP-43**	34.03	37.25
34	**BSP-44**	25.38	35.90
35	**BSP-45**	51.69	22.52
36	**BSP-46**	30.44	42.15
37	**BSP-47**	54.51	20.15
38	**BSP-48**	56.26	22.92
39	**BSP-49**	30.30	29.11
40	**BSP-50**	28.18	39.37
41	**BSP-51**	26.65	38.89
42	**BSP-52**	26.82	39.58
43	**ST-14**	51.62	14.17
44	**Khanapur local**	33.31	35.03
45	**NBS-1**	26.14	41.03
46	**NBS-2**	27.08	33.57
47	**NBS-3**	29.64	38.50
48	**NBS-4**	27.95	39.86
49	**CIP-1**	27.48	40.94
50	**CIP-2**	27.11	37.93
51	**Sree Bhadra (check)**	50.29	21.77
	Mean	33.21	31.17
	S.Em ±	0.25	0.44
	C.D. @ 5 %	0.72	1.23

Table 2. Grouping of sweet potato genotypes into different categories based on per cent weevil infestation

Sl, No.	Per cent weevil infestation	Reaction category	Number of genotypes	Genotypes
1	0-10	Resistant	0	-
2	11-25	Moderately resistant	5	BSP-1, BSP-22, BSP-26, BSP-27, BSP-32
3	26-50	Moderately susceptible	37	BSP-4, BSP-6, BSP-10, BSP-17, BSP-18, BSP-20, BSP-21, BSP-23, BSP-24, BSP-25, BSP-28, BSP-29, BSP-30, BSP-31, BSP-33, BSP-34, BSP-35, BSP-36, BSP-37, BSP-38, BSP-39, BSP-40, BSP-41, BSP-42, BSP-44, BSP-46, BSP-49, BSP-50, BSP-51, BSP-52, NBS-1, NBS-2, NBS-3, NBS-4, CIP-1, CIP-2, Khanapur local
4	51-75	Susceptible	9	BSP-8, BSP-15, BSP-19, BSP-43, BSP-45, BSP-47, BSP-48, ST-14, Sree Bhadra (National check)

4. CONCLUSIONS

The lowest weevil incident were observed in the 5 sweet potato genotypes, among these genotypes four genotypes *viz.*, BSP-1, BSP-26, BSP-27, BSP-32 are good yield compare to check (Sree Bhadra) these four genotypes are considered for future research work and for commercial cultivation.

5. COMPETING INTERESTS

Authors have declared that no competing interests exist.

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