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Relative incidence of quarantine insect pest, *Sternochetus mangiferae* (Coleoptera : Curculionidae) on varieties and new hybrids of mango

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ABSTRACT

Studies on the incidence of mango stone weevil, *Sternochetus mangiferae* (Fabricius) on 18 varieties and 16 hybrids (released and pre-released) were conducted for three years during 2010-2012. Results revealed that all the varieties and hybrids both released and pre-released were susceptible to weevil attack. In varieties high incidence was recorded in Banglora (60.28%), followed by Kesar (48.46%), Manoranjan (42.78%) and Safeda (40.97%). The other commercial varieties, viz. Neelum (37.85%) had higher infestation compared to Baneshan (7.12%). Among all the varieities screened lowest percent infestation was observed in Khader (2.22) and Peterpasand (3.00). Produtur Avakai, Alipasand and Pulihora which were used for pickle purpose also had higher infestation ranging from (30.56-35.71%). In the hybrids Dasheri × Vikarabad shown maximum infestation (73.61%), followed by Padiri × Ambalavi (59.58%). Ratna had lowest infestation of 0.77% compared to Amrapali (43.14%), Mallika (20.56%) and Neeleshan (14.64%).

Key words: Mango varieties, New hybrids, Stone weevil.

Mango is the most popular fruit in the orient, particularly in India. Among the many insects, which are known to occur on the mango tree, the commonly known nut weevil or stone weevil is the important one. The insect is a specific pest on mango and out of a number of species of mango nut weevils, (Balock and Kozuma 1964) only three species, *Sternochetus mangiferae*, *S. frigidus* and *S. gravis* are reported to be of economic importance. The geographical range of *Sternochetus mangiferae* is extensive, having been recorded from all principal mango growing areas of the world (Dey and Pande 1987). In India, it has long been established in the South (Ramakrishna Ayyar 1940) mainly in Andhra Pradesh (Seshagiri Rao *et al*. 1971) and Madras (Sundarababu 1960) and even from North India, i e Punjab (Atwal 1963), whereas *S. gravis* presence is in North East India (Dey and Pande 1987) and South-East Asia (Leefmans 1927). The species, *S. frigidus* was reported from certain areas of Bangladesh (Alam 1972). The grubs and adults feed on the endocarp of the fruit and hasten the maturity of the fruits resulting in the fruits fall from the trees and studies showed that early fruit drop may be caused by severe weevil infestation (Subramanyam 1925, Follett 2002). It causes losses of between 5 and 90%of marketable fruits in the export market (Bagle and Prasad 1985, Verghese 2000). Since the eggs, larvae and pupae are concealed and confined to mango pulp, and the adults confined to seeds, insecticides are not very effective. Moreover, raw mangoes are used for preparing pickles and thus the application of insecticides poses health hazards. The import of Indian mangoes into USA has been withheld for the reason that the pest might be introduced into USA where the insect is not prevalent (Sundarababu 1966). The quarantine restrictions prevent the export of fresh mangoes into uninfected areas (Hansen 1993). Overseas markets for fresh mango fruit are being sought but a major impediment to developing there is the stone weevil, while this insects presence in fruit is inconsequential to domestic markets it has significant quarantine importance.

So mango stone weevil is a barrier to the development of several significant overseas markets as these markets are considered important for the long term prosperity of the mango industry in India. Field spraying of pesticides (Sundarababu 1966, Shukla and Tandon 1985) or field sanitation (Hansen and Armstrong 1990) were not very effective for the control of the mango weevil. The weevil also reduces percent germination of seeds and thus the availability of seed as a source of root stocks propagation is a concern. Hence in this regard mango cultivars resistant to the mango weevil would be beneficial if they also had

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good agronomic characters. Considering the economic importance of the pest, its incidence on mango varieties and hybrids (both released and pre-released) was studied.

MATERIALS AND METHODS

Studies were carried out during the years, 2010, 2011 and 2012 at Horticultural Research Station Farm, Ananthrajupeta of Dr Y S R Horticultural University to study the incidence on eighteen varieties namely, Baneshan (Syn Banganapalli), Manoranjan, Mehmooda Vikarabad, Alipasand, Kesar, Produtur Avakai, Yellamanda, Safeda, Pulihora, Banglora (Syn Totapuri), Neelum, Peddaneelum, Rumani, Khader (Syn Alphonso), Peterpasand, Panchadarakalasa, Dasheri and Ganesh Pasand. Similarly hybrids, viz. Neeleshan, Manjeera, Ratna, Amrapali, Mallika, Prabhasankar, KMH 1 (Kodur Mango Hybrid), Dasheri × Vikarabad and pre-released hybrids namely Padiri × Ambalavi, Panchadarakalasa × Willard, Khader × Jehangir, Alampur Baneshan × Mulgoa, Kodur Goa × Jehangir, Neelum × Panchadarakalasa, Ambalavi × Baneshan and Chinnasuvarnarekha × Padiri. All the varieties were planted in 1995 and hybrids 2005 in RARS Farm. Sample fruits of available mango varieties and hybrids were cut and examined for the incidence of stone weevil, i e destructive sampling is followed. Fifty fruits of each variety and hybrid were collected at harvest per treatment and later on cumulative percent damage was worked out.

RESULTS AND DISCUSSION

The data on incidence revealed that all the varieties and hybrids kept under study were susceptible to the attack of weevil. Several investigations in India revealed that none of the varieties screened were free from infestation; (Singh 1988, Bagle and Prasad 1985.) The data during 2010 and 2012 surprisingly showed higher incidence of weevil in almost all the varieties and hybrids when compared to the data observed in 2011 (Table 1 and Table 2). The maximum infestation was observed in 2012 where the incidence ranged from 4.00-64.00 percent and 2.67 to 61.29 percent incidence in 2010 compared to 2011 data (0.00-55.55%). There were some variations from year to year infestation but this may be due to natural escape or availability of proper size of fruits at the time of egg laying. In 2011, the incidence of weevil was comparatively less in majority of the varieties and highest infestation of 55.55% was observed in Banglora followed by Peddaneelum, Kesar and Yellamanda, whereas Khader and Peterpasand had nil incidence of stone weevil, compared to 2010 and 2012. Field trials carried out in Karnataka, in 1975-79 on the incidence of *Sternochetus mangiferae* in fallen and sample fruits of mango of different varieties by Bagle and Prasad (1985) noted that all varieties of fallen and sample fruits examined were susceptible to the pest and the incidence ranged from 52.39% in Langra to 83.2% in Jehangir in fallen fruits and from 48% to 87% in Totapuri in sample fruits.

Table 1 Incidence of stone weevil on different mango varieties

Varieties	Percent damage			Mean percent damage
	2010	2011	2012	
Baneshan	8.62	4.01	8.72	7.12
Manoranjan	53.33	30.56	44.44	42.78
Mehmooda vikarabad	25.00	16.67	20.83	20.83
Alipasand	38.46	33.33	35.76	35.85
Kesar	52.17	44.44	48.78	48.46
Produtur avakai	26.09	35.71	29.73	30.51
Yellamanda	33.33	38.46	34.21	35.33
Safeda	43.75	37.50	41.67	40.97
Pulihora	22.20	30.56	33.33	28.70
Banglora	61.29	55.55	64.00	60.28
Neelum	39.22	34.33	40.00	37.85
Peddaneelum	31.70	48.78	36.58	39.02
Rumani	8.33	11.67	13.33	11.11
Khader	2.67	0.00	4.00	2.22
Peterpasand	4.00	0.00	5.00	3.00
Panchadarakalasa	7.33	20.00	10.67	12.67
Dasheri	30.50	25.00	27.50	27.67
Ganesh pasand	32.50	30.00	25.00	29.17

Table 2 Incidence of stone weevil on different hybrids

Hybrids	Percent damage			Mean percent damage
	2010	2011	2012	
Neeleshan (Neelum × Baneshan	17.57	13.63	12.72	14.64
Manjeera (Rumani × Neelum)	13.00	17.39	16.00	15.46
Ratna (Neelum × Alphonso)	0.00	2.30	0.00	0.77
Amrapali (Dasheri × Neelum)	41.18	40.00	48.24	43.14
Mallika (Neelum × Dasheri)	25.00	20.00	16.67	20.56
Prabhasankar (Bombay green × Kalepadu)	28.57	34.48	40.00	34.35
KMH-1 (Cherukurasam × Khader)	0.00	5.33	0.00	1.78
Dasheri × Vikarabad	58.33	62.50	100.00	73.61
*Padiri × Ambalavi	59.09	63.64	56.00	59.58
Panchadarakalasa × Willard	4.76	11.90	8.00	8.22
Khader × Jehangir	20.83	25.00	29.17	25.00
Alampur baneshan × Mulgoa	16.67	4.00	13.33	11.33
Kodur goa × Jehangir	7.14	0.00	10.71	5.95
Neelum × Panchadarakalasa	4.17	5.83	0.00	3.33
Ambalavi × Baneshan	11.54	3.85	0.00	5.13
Chinnasuvarnarekha × Padiri	6.67	0.00	5.33	4.00

Note : *S. No 9 to 16 are pre-released hybrids

Among the pickle varieties, Produtur Avakai (35.71%), Alipasand (33.33%) and Pulihora (30.56%) had higher infestation compared to Rumani (11.67%). Among the popular varieties cultivated, Baneshan had less incidence with only 4.0% compared to Neelum. The varieties popular in other states, viz. Dasheri, Kesar and Safeda were also infested with stone weevil where the infestation ranged from 25.00 to 44.44 percent. Godse and Bhole (2003)

reported that out of 92 mango cultivars screened for resistance to *S. mangiferae*, 10 cultivars had no infestation. In 2010, maximum infestation was noticed in Banglora followed by Manoranjan, Kesar and Safeda with percent incidence of 61.29, 53.33, 52.17 and 43.75 percent, respectively, whereas the commercial cultivated varieties, viz. Baneshan and Khader had less incidence. Verghese (2000) recorded that in S. India, the varieties, Banganpalli, Totapuri, Alphonso and Neelum were highly susceptible to stone weevil. The data recorded in 2012, revealed that weevil incidence in Baneshan was <9% and in other varieties, i e Peterpasand and Khader the infestation ranged from 4.00-5.00 percent.

Based on the mean percent damage, the varieties, i e Manoranjan, Safeda, Kesar and Dasheri procured from other states and planted here to understand their performance in local geographical conditions, were also susceptible to stone weevil. In varieties high incidence of nut weevil was recorded in Banglora in all the years under study followed by Kesar (48.46%), Manoranjan (42.78%) and Safeda (40.97%). The lowest incidence was recorded in Khader with 2.22 per cent and the infestation in other varieties ranged from 3.00 to 39.02 percent. Among three popular commercial varieties, viz. Banglora, Neelum and Baneshan cultivated by farmers in Andhra Pradesh, the varieties had different level of infestation and the order of damage that was most susceptible is Banglora > Neelum> Baneshan. These results are in conformity to Seshagiri rao *et al.* (1971) findings who surveyed for stone weevil incidence in popular markets at Kurnool, Anakapalli, Rajamundry, Chittoor and Cuddapah of AP and revealed that Banglora, Neelum and Baneshan were infested with stone weevil insect on an average of 27, 20 and 10 percent, respectively. Similarly Shukla and Prasad (1981) noticed high infestation of weevil in Neelum (92.70%) and low infestation in Langra (41.67%). The studies of Sundarababu (1969) also showed higher incidence in Neelum(100%) and lower in Swarna Jehangir(28%).

When damage was assessed based on mean incidence with respect to pickle varieties, viz. Alipasand, Produtur Avakai, Rumani and Pulihora it was observed that, the former cultivar was highly susceptible (38.46%), followed by Produtur Avakai compared to latter varieties. Among all the varieties used for study only Khader and Peterpasand fruits had lowest damage of weevil attack, i e 2.22-3.00 percent and the range of damage for other varieties being 7.12-60.28 percent. In these studies it has been observed that the mango stone weevil infestation varies with the mango cultivar. The data from the literature (Subramanyam 1925, David and Sundarababu 1962, 1969, Shukla and Prasad 1981) confirm that all the varieties are infested, but not equally.

Similarly hybrids (both released and pre-released) were also evaluated for percent damage and the damage ranged from 0.00 to 59.09 in 2010, 0.00 to 63.64 in 2011 compared to 0.00 to100.00 in 2012. When pre-released hybrids were assessed for percent damage in 2010, Padiri × Ambalavi had maximum infestation (59.09%) and least infestation was observed in Neelum × Panchadarakalasa. as compared to other hybrid. In popular hybrids, viz. Neeleshan, Mallika, Manjeera, Amraplai and Ratna the damage of the weevil ranged from 0.00 to 41.18 %.

Similarly in 2011, Among the 8 pre-released hybrids, except Padiri × Ambalavi (63.64%) and Khader × Jehangir (25.00% damage), the damage was in the range of 0.00 to 11.90% and these results were repeated again in 2012, where the former had maximum weevil damage of 56.00% compared to latter hybrid and in others the damage was in the range of 0.00 to 10.71%.

The mean data revealed that in hybrids, Dasheri × Vikarabad shown maximum damage of 73.61% and less infestation was in Ratna hybrid which is cross of Neelum × Alphonso. Among the pre-released hybrids, Padiri × Ambalavi had 60% infestation followed by Khader × Jehangir and lowest fruit damage was noticed in Neelum × Panchadarakalasa. The other hybrids, viz. Amrapali (Dasheri × Neelum), Mallika (Neelum × Dasheri), Neeleshan (Neelum × Baneshan) and Manjeera (Rumani × Neelum) were also susceptible to stone weevil, but the infestation ranged from 14.64 to 43.14% damage.

It is interesting to note that though the hybrids have a one common parent but the degree of susceptibility varied, viz. Khader × Jehangir (25.0%) and Kodur Goa × Jehangir, the damage was only 5.95 percent with the latter hybrid. In different varieties studied (Table 1), though Neelum was highly susceptible to stone weevil, but the hybrids with Neelum as one of the parent, the percent damage varied, viz. 0.77, 14.64 and 15.46 percent in Ratna, Neeleshan and Manjeera, respectively indicating that if varieties are susceptible the hybrids damage may vary although the susceptible variety is one of the parent. These findings are in conformity to Singh (1988) investigation where hybrid 11/15-Neelum × Himayuddin (17.33%) showed less infestation while Neelum (65.33%) was severely infested. Similarly negligible incidence of stone weevil was observed in Ratna and Alphonso (Godse and Bhole 2003).

In all the years under study, maximum infestation of 60.28% was observed in Banglora variety followed by Kesar with 48.46% and least infestation was observed with Khader (Alphonso) of 2.22%. The variation in the degree of infestation may however be attributed to different climatic conditions prevailing at all the places reviewed (Singh 1988). In conclusion, though the percent damage in mango varieties and hybrids varied during three years observation period, the mean data revealed that infestation ranged from 2.22 to 60.28% in the varieties whereas 0.77 to 73.61% in the hybrids indicating that the susceptibility varies but none of the mango varieties and hybrids screened are resistant to stone weevil.

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