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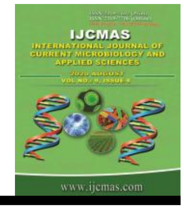

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Evaluation Elite Grain Amaranth Genotypes for Major Insect-Pest Resistance

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A B S T R A C T

Investigation on evaluation grain amaranth genotypes against incidence of insect pests was undertaken at MRS, Hebbal, Bengaluru. During study period, among 32 genotypes screened against leaf webber at seedling stage, 25 genotypes were tolerant and 7 genotypes were highly tolerant. At vegetative stage 16, 10 and 6genotypes were highly tolerant, tolerant and moderately tolerant, respectively. At grain filling stage14, 15 and 3 genotypes were moderately tolerant, susceptible and highly susceptible, respectively. The genotypes KBGA-5, RHGA-13-1, RHGA-13-2, RMA-7, MGA-15, KBGA-4, BGA-38, BGA-43, SKGPA-75, RJAS-08-17, MGA-12, KBGA-7, IC-032193 and IC-035713 were tolerant at seedling, vegetative and grain filling stage ranging from 0 to 50 per cent leaf damage.

Introduction

One of the greatest limiting factors in increasing the productivity of leaf amaranth is the damage caused by wide range of insect pests in general, whereas defoliators can cause economic loss (Akinolosotu, 1977). Aderolu *et al.,* (2013) reported 60 insect species associated with amaranthus crop. *Hymenia recurvalis* caused 8.8 per cent infestation, however, *H.recurvalis* and *Psarabasalis* were also common. Agarwal (1985) reported *Hypolixus* sp., is a major pest in cultivated amaranth. Leaf miner, *Liriomyza* sp. (Sorensen, 1995), aphid, *Myzuspersicae* are major pest of amaranthus causing leaves to curl and become unattractive for marketing (Picker *et al*., 2004; Okunlola *et al.*, 2008). Richard (1989) reported that the leaf worms or cutworms *Spodoptera* sp., attack young seedlings. Amaranth leaf webber or webworm larvae fold or web amaranth leaves using their silken webs and feed within the leaves. *Hymenia recurvalis, Psarabasalis, Herpetograma bipunctalis* are major pests of grain amaranth (Batra and Bhattacherjee, 1960; Bhattacherjee *et al.*, 1964 Clarke-Harris *et al.*, 2003; James *et al.*, 2010 and Grovida, 2015). Information on grain amaranth genotypes evaluated for insect pests found to be very scanty. Based on this information efforts were made to study the grain amaranth genotypes were screened against insect pests.

Materials and Methods

Screening of genotypes against major insect pests of grain amaranth under field conditions

Field experiment was laid out with a plot size of 3.27 m x 2.27 m. Amaranth belonging to 32 genotypes were screened against leaf webber with three replications. Five amaranth plants in each genotype were tagged randomly to record number of leaf webber and per cent damage caused by leaf webber at seedling stage, vegetative stage and grain filling stage of the crop.

The genotypes were classified as highly tolerant, tolerant, moderately tolerant, susceptible and highly susceptible based on the percent leaf damage done by leaf webber (Table 1 and Plate 2).

Results and Discussion

A total of 32 genotypes were screened against leaf webber under field conditions during 2016 (Table 2). Number of leaves damaged by the leaf webber at seedling, vegetative and grain filling stage of grain amaranth was recorded.

Leaf webber damage at seedling stage of grain amaranth

KBGA-8, GA-2, RHGA-13-2, RHGA-13-1, Suvarna, IC-032193, VL-44, KBGA-5, SKGPA-91, IC-035711, RMA-59, Annapurna, KBGA-10, KBGA-11, RMA-7, KBGA-7, MGA-12, RJAS-08-17, SKGPA-75, BGA-38, BGA-43, KBGA-1, KBGA-4, MGA-15, IC-035713 were found to be highly tolerant with leaf damage was 0-5 per cent. Leaf damage was 6-25 per cent in KBGA-9, BGA-7-1, BGA-29, SKKGPA-86, RGA-11, BGA-2 and SKGPA-74 with 6-25 per cent leaf damage (Table 2).

Leaf webber damage at Vegetative stage of grain amaranth

Among the amaranth genotypes, KBGA-5, RHGA-13-1, RHGA-13-2, RMA-7, MGA-15, KBGA-4, BGA-38, BGA-43, SKGPA-75, RJAS-08-17, MGA-12, KBGA-7, IC-032193 and IC-035713, leaf webber damage was 26-50 per cent, which was significantly lesser than in other genotypes. This was followed by KBGA-8, BGA-7-1, BGA-29, SKKGPA-86, RGA-11, SKGPA-91, RMA-59, GA-2, Suvarna SKGPA-74 KBGA-1, GA-2, RMA-7 KBGA-11 and Annapurna with 51-75% leaf damage. IC-035711, KBC-8, BGA-2 andKBGA-1076 recorded 100% damage by leaf webber (Table 1).

Table.1 Scoring of grain amaranth genotypes based on leaf damage caused by leaf webber

Scoring	Per cent leaf damage	Classification of genotypes
0	0-5	Highly tolerant
1	6-25	Tolerant
2	26-50	Moderately tolerant
3	51-75	Susceptible
4	76-100	Highly Susceptible

(Priya, 1998)

Table.2 Screening of amaranth genotypes against leaf webber (*Hymenia recurvalis)* at different stages of crop growth

Stages of genotypes	Leaf damage (%)	Reaction
Seedling stage		
KBGA-8, GA-2, RHGA-13-2, RHGA-13-1, Suvarna, IC-032193, VL-44, KBGA-5, SKGPA-91, IC-035711, RMA-59, Annapurna, KBGA-10, KBGA-11, RMA-7, KBGA-7, MGA-12, RJAS-08-17, SKGPA-75, BGA-38, BGA-43, KBGA-1, KBGA-4, MGA-15 and IC-035713.	0-5	HT
KBGA-9, BGA-7-1, BGA-29, SKKGPA-86, RGA-11, BGA-2 and SKGPA-74.	6-25	T
Vegetative stage		
RHGA-13-1, GA-2, VL-44, RMA-7, KBGA-10, SKGPA-75, SKGPA-91, KBGA-5, KBGA-1, KBGA-11, MGA-15, RHGA-13-2, KBGA-8, MGA-12, KBGA-7and IC-035713.	0-5	HT
SKGPA-74, Suvarna, IC-032193, IC-035711, RMA-59, Annapurna, RJAS-08-17, BGA-43, BGA-38, and KBGA-4.	6-25	T
BGA-2, RGA-11, SKKGPA-86, BGA-29, BGA-7-1 and KBGA-9.	26-50	MT
Grain filling stage		
KBGA-5, RHGA-13-1, RHGA-13-2, RMA-7, MGA-15, KBGA-4, BGA-38, BGA-43, SKGPA-75, RJAS-08-17, MGA-12, KBGA-7, IC-032193, and IC-035713.	26-50	MT
KBGA-8, KBGA-9, BGA-7-1, BGA-29, SKKGPA-86, RGA-11, SKGPA-91, RMA-59, GA-2, Suvarna, SKGPA-74, KBGA-1, KBGA-11, Annapurna and VL-44.	51-75	S
IC-03711, BGA-2 and KBGA-10		HS
HT : Highly tolerant; T : Tolerant; MT : Moderately tolerant; S: Susceptible; HS : Highly Susceptible		

Table.3 Reaction of amaranth genotypes against leaf webber, *Hymenia recurvalis*

SL.NO.	Genotypes	Leaf damage (%)	Scoring	Reaction
1	KBGA-8	49.40	2	MT
2	RHGA-13-1	41.50	2	MT
3	RHGA-13-2	41.65	2	MT
4	RMA-7	48.40	2	MT
5	MGA-15	44.20	2	MT
6	KBGA-4	46.62	2	MT
7	BGA-38	46.70	2	MT
8	BGA-43	47.13	2	MT
9	SKGPA-75	47.21	2	MT
10	RJAS-08-17	47.34	2	MT
11	MGA-12	47.41	2	MT
12	KBGA-7	47.65	2	MT
13	IC-032193	47.79	2	MT
14	IC-035713	47.84	2	MT

MT: Moderately tolerant

Leaf webber damage at grain filling stage

Among the amaranth genotypes, KBGA-5, RHGA-13-1, RHGA-13-2, RMA-7, MGA-15, KBGA-4, BGA-38, BGA-43, SKGPA-75, RJAS-08-17, MGA-12, KBGA-7, IC-032193, IC-035713 were found to be moderately tolerant with 26-50% leaf damage and was significantly lesser than in other genotypes (Table 2).

The genotypes IC-03711, BGA-2 and KBGA-10 were found to be highly susceptible to leaf webber with 76-100 per cent leaf damage (Table 3).

Much effort has not been made on screening of genotypes against insect pests of grain amaranth. Thirty two genotypes were screened against leaf webber. At seedling stage 25 genotypes were found to be highly tolerant and 7 genotypes were found tolerant to leaf webber, respectively.

At vegetative stage, 16, 10 and 6 genotypes were found to be highly tolerant, tolerant and moderately tolerant against leaf webber, respectively. At grain filling stage 14, 15 and 3 genotypes were found to be moderately tolerant, susceptible and highly susceptible to leaf webber respectively. Amaranth genotypes *viz.*KBGA-5, RHGA-13-1, RHGA-13-2, RMA-7, MGA-15, KBGA-4, BGA-38, BGA-43, SKGPA-75, RJAS-08-17, MGA-12, KBGA-7, IC-032193 and IC-035713 were tolerant at seedling, vegetative and grain filling stage and leaf damage was 0 to 50 per cent.

Resistant and tolerant cultivars form the basic component of Integrated Pest Management (IPM). Even a low level of tolerance in plants has a dramatic effect, which in fact reduces the need of insecticides. Use of resistant or less-susceptible cultivars is one of the most important methods of keeping insect populations below economic threshold levels.

However, host-plant resistance is not a panacea for all pest problems. It is most useful when carefully utilized with other components of pest management. Pest resistant varieties, thus combating biotic stresses and reaping good yield is the need of the hour (Kavitha and Dharma Reddy, 2012).

Pest management involves several divergent measures to minimize the losses due to insect pests. Insect resistant varieties form an important component of pest management schedule. Thus resistance is a relative property and can be defined only in comparison to other more susceptible varieties (Sundarbabu, 1968).

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