

drainage area. The climatic factor (rainfall) together with the effect of these factors explained the runoff from the sub-basins. The extent of relationship of these factors with riverflow varied for both the river basins but the nature remained the same. All of these factors were inter-related and related to drainage area. Hence, drainage area and rainfall can be considered as the most powerful factors influencing discharge. Benson (1962) developed an equation for the peak discharge for 164 basins of New England in terms of drainage area and annual rainfall. Average monthly monsoon discharge and rainfall were significant for the Chaliyar and Kabbani river basins and the discharge had high correlations with the rainfall and drainage area. The variations in runoff with rainfall and watershed characteristics were emphasized earlier but the extent of relationship between streamflow and the morphological parameters in the present study were different, due to the change in topography of the river basins.

The streamflow is a function of the morphological and climatic factors. The most powerful factors are the drainage area and the

monsoon rainfall. The peak flow is lower for a higher confluence ratio. Monthly monsoon discharge is more influenced by the rainfall of the same month. Non-monsoon discharge formed a very small fraction of the total discharge. Alterations in the runoff parameters by natural reasons or human intervention affect the streamflow.

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GERMPLASM SCREENING AGAINST SESAME LEAF ROLLER AND POD BORER

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ABSTRACT

Twenty promising less susceptible sesame entries and one wild species were screened against sesame leaf roller and pod borer in *in vivo* and *in vitro* conditions and compared with five local varieties. Under *in vivo* condition 12 entries viz., SI 1004, SI 1029, SI 3315/11, SI 3315/6, SI 53, SI 882, 020-1, 59-1-1, PDK31, SI 889, SI 990 and SI 964 were moderately resistant. However, only seven entries viz., SI 3315/11, SI 53, SI 882, 59-1-1, PDK 31, SI 889 and SSI 990 were identified as moderately resistant under *in vitro* condition. The wild species, *Sesamum alatum* and two entries viz., ES 22 and SI 250 were highly resistant and resistant to this pest respectively under both conditions.

Sesame leaf roller and pod borer *Antigastra catalaunalis* Duphonchel (Pyraustidae : Lepidoptera) is considered to be the most destructive pest and has been causing considerable damage to the crop (Abraham *et al.*., 1977.) This pest during its larval stage damages the leaves, buds, flowers and pods till harvest of the crop (Mahadevan and Mohanasundram, 1986).

Murali Baskaran *et al.*., (1989) screened 1200 sesame entries against leaf roller under field condition and reported 16 entries as field resistant. In the present investigations, 20 promising, less susceptible sesame entries reported earlier by Mahadevan (1988), one wild species, *Sesamum alatum* and five local varieties were screened in *in vivo* and *in vitro* conditions.

Table I. *In vivo* screening of sesame against *A. catalaunalis*

Entry	Leaf damage* (%)	Internal content of capsule fed* (%)	Grade	Reaction
SI 935	40.0 (39.15)	10.3 (17.13)	7	S
SI 1004	30.0 (33.00)	14.3 (21.83)	5	MR
SI 1029	33.3 (35.22)	8.6 (17.14)	5	MR
SI 1671	40.0 (39.23)	10.5 (17.56)	7	S
SI 3315/11	24.7 (28.52)	8.2 (15.88)	5	MR
SI 3315/6	28.3 (31.91)	12.4 (20.04)	5	MR
SI 53	23.5 (28.94)	11.8 (19.83)	5	MR
SI 882	27.8 (30.58)	9.3 (17.33)	5	MR
SI 1002	66.7 (54.78)	28.6 (31.11)	9	HS
020-3-1	22.4 (27.33)	6.4 (14.09)	5	MR
59-1-1	33.3 (35.28)	5.8 (12.33)	5	MR
PDK 31	16.7 (23.85)	10.4 (18.25)	5	MR
SI 889	30.0 (33.21)	5.9 (13.73)	5	MR
SI 990	38.0 (37.44)	6.9 (15.11)	5	MR
SI 75	60.0 (50.77)	22.2 (27.49)	9	HS
SI 964	30.0 (33.21)	12.5 (19.76)	5	MR
SI 968	43.3 (41.22)	6.3 (13.39)	7	S
SI 953	35.3 (35.88)	19.7 (26.04)	7	S
ES 22	7.4 (15.13)	6.1 (14.21)	3	R
SI 250	11.4 (18.83)	5.2 (12.99)	3	R
<i>Sesamum alatum</i> (Wild species)	6.3 (13.33)	2.3 (8.91)	1	HR
TMV 3	46.7 (43.08)	14.2 (21.34)	7	S
TMV 3	40.0 (39.23)	16.6 (23.61)	7	S
CO 1	43.3 (41.15)	11.8 (19.84)	7	S
SE (d)	2.9	1.9		
CD (P=0.05)	5.8	4.0		

Figures in parentheses are arcsine values; * Mean of three replications

R : Resistant; MR : Moderately resistant; HR : Highly resistant

S : Susceptible; HS : Highly susceptible

MATERIALS AND METHODS

Experiment was conducted in *in vivo* condition at the Regional Research Station, Vridhachamlam during 1988 rainy season. The entries tested are listed in tables. Each entry was raised in a single row of 4 m length with 15 cm between plants and replicated thrice in randomized block design. The per cent leaf damage was recorded 45 days after sowing (DAS) by counting number of affected leaves to the total number of leaves (Anon., 1987). On 70 DAS, the per cent internal content of capsule fed by larva was observed in 20 capsules randomly collected from each entry. The intensity of feeding on capsule was quantified as per the following method.

Number of locule fed by larva	%
1	25
2	50
3	75
4	100

In case of multilocular capsule, whole capsule was considered as 100 per cent and percentage of damage was given accordingly. Based on two types of data collected, score was given to categorise test entries into either resistant or susceptible. The method of scoring is as follows.

Table 2. *In vitro* screening of sesame against *A. catalaunalis*

Entry	Leaf damage* (%)	Internal content of capsule fed* (%)	Grade	Reaction
SI 935	22.1 (27.99)	22.5 (27.82)	7	S
SI 1004	18.1 (25.07)	21.0 (27.53)	7	S
SI 1029	20.8 (27.28)	28.3 (30.93)	7	S
SI 1671	22.2 (28.05)	24.4 (28.41)	7	S
SI 3315/11	13.6 (21.63)	11.8 (20.13)	5	MR
SI 3315/6	23.8 (29.01)	26.1 (29.68)	7	S
SI 53	13.9 (21.04)	10.5 (18.05)	5	MR
SI 882	15.4 (22.94)	15.6 (23.11)	5	MR
SI 1002	26.3 (29.84)	36.1 (35.55)	7	S
020-3-1	24.2 (29.41)	22.8 (27.17)	7	S
59-1-1	16.1 (23.61)	16.7 (24.43)	5	MR
PDK 31	14.3 (22.10)	11.9 (19.71)	5	MR
SI 889	14.0 (21.94)	12.5 (20.01)	5	MR
SI 990	15.0 (22.77)	14.4 (21.24)	5	MR
SI 75	42.6 (40.43)	20.6 (25.10)	9	HS
SI 964	26.3 (30.61)	23.8 (29.39)	7	S
SI 968	43.0 (40.74)	28.2 (31.82)	9	HS
SI 953	19.1 (25.46)	24.4 (28.60)	7	S
ES 22	10.8 (19.19)	4.3 (11.12)	3	R
SI 250	11.1 (19.46)	5.9 (13.88)	3	R
<i>Sesamum alatum</i> (Wild species)	6.1 (14.30)	0.9 (5.03)	1	HR
TMV 3	29.9 (33.11)	31.9 (33.76)	7	S
TMV 4	28.6 (33.14)	32.1 (34.18)	7	S
TMV 5	27.9 (31.92)	38.8 (37.48)	7	S
TMV 6	28.7 (32.38)	32.7 (34.51)	7	S
CO 1	21.5 (27.11)	17.3 (23.35)	7	S
SE (d)	4.3	2.4		
CD (P=0.05)	8.7	4.8		

Figures in parentheses are arcsine values; *Mean of three replications

R : Resistant; MR : Moderately resistant; HR : Highly resistant

S : Susceptible; HS : Highly susceptible

Score	% leaf damage	% internal content of capsule fed	Cumulative score	Grade	Category
1	0.0-10	0.0-5	0-1	1	Highly resistant (HR)
3	10.1-20	5.1-10	> 1-3	2	Resistant (R)
5	20.1-30	10.1-15	3-5	5	Moderately resistant (MR)
7	30.1-40	15.1-20	5-7	7	Susceptible (S)
9	> 40	> 20	7-9	9	Highly susceptible (HS)

$$\text{Cumulative score} = \frac{a + b}{2}$$

where, a=corresponding score for % leaf damage

b=corresponding score for % internal content of capsule fed

In *in vitro* condition, each entry was grown individually in a separate pot during 1988 cold weather season and replicated thrice. Two-day-old laboratory cultured leaf roller larvae were artificially inoculated two times on 30 and 60 DAS at the rate of one larva per plant. A week after first inoculation and 15 days after second inoculation,

the per cent leaf damage and the internal content of capsule fed by larva were recorded respectively and the degree of resistance of each entry was calculated as per the above said method.

RESULTS AND DISCUSSION

The data on reaction of different entries to sesame leaf roller and pod borer in *in vivo* and *in vitro* are given in Table 1 and 2 respectively. In *in vivo* condition, *S.alatum* was highly resistant to this pest with grade 1 followed by ES 22 and SI 250 which were resistant with grade 3, also reported by Mahadevan (1988) and Murali Baskaran and Mahadevan (1989). The entries viz., SI 1004, SI 1029, SI 3315/11, SI 3315/6, SI 53, SI 882, 020-3-1, 59-1-1, PDK 31, SI 889, SI 990 and SI 964 were moderately resistant with grade 5 and the leaf damage ranged from 16.7 per cent (PDK31) to 33.3 per cent (59-1-1 and SI 1029). SI 1002 and SI 75 were highly susceptible with grade 9 while local varieties were susceptible to this pest with grade 7 and recorded more than 40 per cent leaf damage. In *in vitro* condition, the lowest per cent leaf damage was recorded in *S.alatum* (6.1%) followed by ES 22 (10.8%), SI 250 (11.1%), SI 3315/11 (13.6%), SI 53 (13.9%) SI 889 (14.00%), PDK 31 (14.3%), SI 990 (15.0%) and SI 882 (15.4%) which were on par with each other. The leaf damage ranged from 18 to 26 per cent in SI 935, SI 1004, SI 1029, SI 1671, SI 3315/6, SI 1002, SI 020-3-1 and SI 964 which were at par with check varieties while, the highest leaf damage of around 40 per cent was recorded in SI 75 and SI 968.

The pod borer larva did not prefer the internal content of capsule of *S.alatum* and caused only the lowest damage of 0.9 per cent which was significantly different from other entries. The entries followed the wild species were ES 22 (4.3%) and SI 250 (5.9%) in which the larva just nibbled the capsule and stopped the feeding which indicated the presence of non preference factor in these entries while the susceptibility was observed to be more in local varieties recording more than 20 per cent damage. The entries viz., SI 3315/11 SI 53, SI 882, PDK 31, SI 889 and SI 990 were less susceptible to pod borer, ranging from 10.5 per cent

(SI 53) to 15.6 per cent (SI 882). Among the germplasm entries, SI 1002 was highly susceptible with 36.1 per cent pod borer damage.

The wild species, *S.alatum* was highly resistant to sesame leaf roller and pod borer with grade 1 while SI 75 and SI 968 were highly susceptible with grade 9. The entries followed the wild species were ES22 and SI 250 which were resistant to this pest with grade 3. Seven entries viz., SI 3315/11, SI 53, SI 882, SI 59-1-1, PDK 31, SI 889 and SI 990 were moderately resistant with grade 5 while the grade 7 was recorded in SI 935, SI 1004, SI 1029, SI 1671, SI 3315/6, SI 1002, SI 020-3-1, SI 964, SI 953, TMV 3, TMV 4, TMV 5, TMV 6 and Co 1 which were susceptible to this pest.

A perusal of the data indicated that *S.alatum*, ES 22 and SI 250 were resistant to sesame leaf roller and pod borer under both conditions. The narrow leaf blade of *S.alatum* prevented the webbing activity of this pest which is one of the factors for resistance. In some cases, the germplasms which proved moderately resistant in *in vivo* condition proved susceptible in *in vitro* condition. SI 1004, SI 1029, SI 3315/6, 020-3-1 and SI 990 which were moderately resistant under field condition were found to be susceptible under laboratory condition, while SI 75 was highly susceptible to this pest under both conditions.

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