Original Research Article

Field Screening of Sesame Accessions against Leaf Roller and Capsule Borer (*Antigastra catalaunalis* Dup.)

Abstract:

One hundred twenty nine accession of sesame with susceptible(TC-25) and resistance check (SI-250) were screend under natural condition during two consecutive seasons of 2019 and 2020 to identify the source of resistance against leaf roller and capsule borer (*Antigastra catalaunalis* Dup.) at AICRP on oilseeds sesame center of JNKVV, College of Agriculture, Tikamgarh (M.P.). The sesame accession were categorized as highly resistant (HR), resistant (R), moderately resistant (MR), susceptible (S) and highly susceptible (HS) based on the cumulative score (0-9) and grade (1-9) of the individual accsession. Among 131 accession accession *viz*., In pooled analysis, leaf damage ranged from 0.0 to 40.0 against 40.0 and 0.0 % on susceptible and resistant checks, Flower damage ranged from 0.0 to 29.6 against 15.85 and 1.3 % on susceptible and resistant checks , respectively, while capsules damage ranged from 0.0 to 17.15 % against 3.05 and 0.4 % on susceptible and resistant checks, respectively.In pooled analysis none of the accession were found free from infestation of *A.catalaunalis*.Based on the cumulative scoring ,twenty one accession namely EC-334961-1, Annand local, IS-653-A, NIL-16426, IC-14331, NIC-8282, IS-387, G-13, EC-334955, NIC-8062, G-8, SI-1925, EC-35000, G-19, IS-90, GRT-83138, EC-303423-C, NIC-17362-A, ES-310420, IS-178-C, SI-250 and forty one accession namely S-0481, ES-75, TILO/Hana, EC-335001-A, S-003116, NIC-16114-B, BS-61, EC-164966, KMR-90, EC-335003, IS-722-2-84-I, NIC-17477-I, 43994, Oct.-81, Ec-182832, NIC-8033, G-2, G-6, NIC-9835, IS-77, GRT-8327, S-0619, ES-131-I-84, IC-152485, IS-449, IS-150-3-84, ES-64, IC-30884 ,GRT-8359, S-0281, IS-712, GRT-83128, NIC-16218, KJS-21, NIC-14730, Juland Sahame, SI-1865-1-B, GSM-21, IS-346, S-01159-C, GRT-8336. With resistance check, SI -250 (RC) were rated as highly resistant and resistance these could be a possible source of resistance and used in breeding programs to develop resistant varieties. These germplasm lines might be exploited in the hybridization programs for development of the resistant cultivars.

Key Words: Sesame, *Antigastra catalaunalis* (Dup.), Screening, Accession

Introduction

Sesame (*Sesamum indicum* Lin.) known as the “queen of oil seeds” is one of the most ancient oilseed crop of the world. In India, it is grown in the entire crop growing season viz., *kharif,* late kharif, rabi, and summer seasons Ahirwar *eat al* (2009 [1]. Its seeds contain 52- 57 per cent oil and 25 per cent protein (Smith *et al.,* 2000) [9]The total globally area held on sesame in 128.21 lakh ha with their production 65.49 lakh tones and productivity 511kg / ha .(Anonymous,2021 **)**.India ranks first in area of , production and export of sesame in the world. It is grown in India with an area of 16.22 lakh ha, 6.57 lakh tonnes production and 405 kg ha-1 productivity **.In** Madhya Pradesh an area of about 3.15 lakh ha with as production of 1.26 lakh tones and productivity of 400 kg/ha. In Tikamgarh district it occupies 8714 ha with the productionof 4174 metric tonnes and productivity of 479 kg /ha. Anonymous, **2019-20)** .The biotic and abiotic factors are the major constraints of Sesame production. Among the biotic factors insect pest and diseases surely cause yield loss of sesame. Damage due to insect pests is one of the major factors causing low productivity. The crop is attacked by 29 species of insect pests in different stages of its growth (Biswas *et al.*, 2001). Among these, leaf roller/capsule borer (*Antigastra catalaunalis* Dup.) is one of the major pests of sesame. It damages the crop during the vegetative, flowering and maturity stages of growth. Larvae feed on the tender shoots of the host plants; roll the leaves and make nest by webbing of the leaves together, whereas at flowering stage it feeds on the flowers a the and at capsule stage it bores into the capsules. It causes economic loss to an extent of 43.1% (Gupta *et al.*, 2002). Chemical insecticides are widely used for the management of this pest but it is not environment friendly. The development of resistant variety is a cheap, viable environment-friendly approach to overcome this problem. Considering this, evaluation studies of the sesame accessions to identify the resistant line against *A. catalaunalis* were carried out.

MATERIAL AND METHODS

One hundred twenty nine accessions of sesame with susceptible (TC-25) and resistant check (SI-250) were screened under natural conditions against *A. catalaunalis* at AICRP on oilseed Sesame centre of JNKVV , College of Agriculture, Tikamgarh (M.P.). Sesame accessions were provided by the Project Coordinating unit AICRP (Sesame & Niger), Jabalpur (M.P.). The experiment was conducted during two consecutive seasons of 2019 and 2020. The accession lines were sown in the first fortnight of July during each season with recommended agronomic practices except plant protection. Two rows of each accession were grown in 5 m row length with spacing of 45 cm between rows and 10 cm between plants. Two lines of susceptible checks (TC-25) were grown across the periphery of accessions lines as well as after every ten accession lines to create favorable environment for *A. catalaunalis* infestation. Observations on damage caused by *A. catalaunalis* were recorded at leaf damage (30 DAS), flowering (45 DAS) and capsule stage (70 DAS) on ten randomly selected plants of each genotype. The per cent damage was calculated according to the equation

$$\%\ \text{damage, Plant, Flower and capsule} = \frac{\text{(Number of damaged,plant,flowers \& capsules)}}{\text{Total number of plant , flowers and capsules}} \times 100$$

Per cent flower and capsule damage of two seasons were pooled. Range of damage per cent of each reaction was taken according to AICRP on Sesame and Niger (Anonymous, 2020) presented in Table 1. According to reaction, first the accessions were categorized 0-9 score chart formulated by Sridhar and Gopalan (2002), According to cumulative score, allotted a grade and resistant rating of each accession.

Table 1: Scoring methodology for evaluation of sesame genotypes against *A. catalaunalis*.

Leaf (A)	Flower (B)	Pod C	Cumulative score (A+B+C)/3
0-10	0-5	0-2	1
10-20	5-10	2-4	3
20-30	10-15	4-6	5
30-40	15-20	6-8	7
>40	>29	>8	9

Table 2: Grading method for evaluation of sesame genotype against *A. catalaunalis*

Cumulative score	Grade	Degree of resistance
0-1	1	Highly resistant(HR)
1.1-2	3	Resistant (R)
2.1-3	5	Moderately resistant (MR)
3.1-5	7	Susceptible (S)
5.1-9	9	Highly Susceptible (HS)

Results and Discussion

The experiment was taken up under sown condition so as to get mximum *Antigastra* infestation. one hundred thirty one entries including resistant (SI 250) and susceptible checks (TC-25) were screened for the reaction to leaf roller / capsule boere (*Antigastra catalaunis*) was observed at Leaf ,Flower and capsule or maturity stage . The intensity of damage assessed on different plant parts at various stages. The infestation of *A. catalaunalis* was observed from early vegetative (30 DAS), flowering (50 DAS) and capsule formation stages (70 DAS). It is found that none of the genotypes were free from the infestation by *A. catalaunalis*. This finding was in conformity with the study made by [4, 5, 11] who also reported that incidence of *A. catalaunalis* from early vegetative stage to capsule maturation stage. In the first year intensity of leaf damage at 30 DAS were ranged from 0.0 to 40.0% against 40.0% and 0.0 on susceptible and resistant checks, respectively. In the second year of field screening, it ranged from 0.0 to 40.0 % against 40.0 and 0.0 % on susceptible and resistant checks, respectively. Pooled analysis of leaf damage at 30 DAS infestation ranged from 0.0 to 40.0% against 40.0 to 0.0 % on susceptible and resistant checks, respectively(**Table 3& Table 4**). Our results are in parallel with those of Swapna *et a*l (2021)whereas the mean leaf damage, 2.20% and 22.00% was found in resistant (TKG 22) and susceptible checks (Swetha thil), respectively.

In the first year intensity of flower damage at 45 DAS were ranged from 0.0 to 52.6 % against 18.0 % and 2.6 % on susceptible and resistant checks, respectively. In the second year of field screening, it ranged from 0.0 to 22.0 % against 13.3 % and 0.0 % on susceptible and resistant checks, respectively. Pooled analysis of flower damage at 45 DAS infestation ranged from 0.0 to 29.6 % against 15.8% to 1.3 % on susceptible and resistant checks, respectively(**Table 3& Table 4**). Our results are in parallel with those of Shrivastava *et al.* (2002) and Mishra *et al* (2015), who reported flower damage by *A. catalaunalis* up to 75.0% and 85.0 %.which also reported mean percent flower damage at 50 DAS was recorded between 22.50% swapana , *et al* (2021) .In the first year of field screening of accessions, Capsules damage at 70 DAS were ranged from 0.0 to 6.8 % against 5.5 and 0.0 % on susceptible and resistant checks, respectively during second year of field screening.of accession , capsule damage at 70 DAS were ranged from 0.0 to 28.2 % against 6.8 and 0.8 % on susceptible and resistant checks, respectively . Pooled analysis of capsule damage ranged from 0.0 to 17.15 % against 6.15 and 0.4 % on susceptible and resistant checks, respectively. In pooled analysis none of the accessions were found free from infestation of *A. catalaunalis* (**Table 3 & Table 4**). Parallel finding was also reported by Gupta (2004) , Kumar *et al.* (2010), Mishra *et al* (2015) and swapna *et al* (2021). In the present study, flowers and capsules were damaged maximally in almost all the accessions of first year of field screening; it was directly related to the incidence of *A. catalaunalis.* Comparable finding was also reported by Balaji and Selvanarayanan (2009).

The sesame accession were categorize as highly resistance (HR),resistance (R),moderately resistance (MR),susceptible (S) and highly susceptible (HS)based on cumulative score (0-9)and grade (1-9) (**Table 1& Table 2**)of the individual accession .based on the cumulative scoring of accession ,twenty one accession namely EC-334961-1, Annand local, IS-653-A, NIL-16426, IC-14331, NIC-8282, IS-387, G-13, EC-334955, NIC-8062, G-8, SI-1925, EC-35000, G-19, IS-90, GRT-83138, EC-303423-C, NIC-17362-A, ES-310420, IS-178-C and resistance check SI 250(RC) were rated highly resistance,41, 47, 20 and 3 accessions were rated resistance, moderately resistant, moderately susceptible and susceptible, respectively (**Table 3& Table 4**). Results of field screening revealed that most of the accessions were rated moderately resistant and moderately susceptible, while none of the accessions were found highly susceptible. Gupta (2004), Balaji and Selvanarayanan (2009) also reported that none of the accessions were found highly susceptible.

It is concluded, that the accession line both highly resistance (HR) and resistance (R) are IS-653-A, NIL-16426, IC-14331, NIC-8282, IS-387, G-13, EC-334955, NIC-8062, G-8, SI-1925, EC-35000, G-19, IS-90, GRT-83138, EC-303423-C, NIC-17362-A, ES-310420, IS-178-C.S-0481, ES-75, TILO/Hana, EC-335001-A, S-003116, NIC-16114-B, BS-61, EC-164966, KMR-90, EC-335003, IS-722-2-84-I, NIC-17477-I, 43994, Oct.-81, Ec-182832, NIC-8033, G-2, G-6, NIC-9835, IS-77, GRT-8327, S-0619, ES-131-I-84, IC-152485, IS-449, IS-150-3-84, ES-64, IC-30884 ,GRT-8359, S-0281, IS-712, GRT-83128, NIC-16218, KJS-21, NIC-14730, Juland Sahame, SI-1865-1-B, GSM-21, IS-346, S-01159-C, GRT-8336 and SI-250 (RC) could be a possible source of resistance and it could be used in breeding programme to develop resistance varieties.

Table 3: Classification of sesame accession germplasm based on cumulative score of damage caused by *Antigastra catalaunalis*.

S. No.	Reaction / Response	Cumulative score	Grade	No. of genotypes	Genotypes
1	Highly resistant(HR)	0-1	1	21	EC-334961-1, Annand local, IS-653-A, NIL-16426, IC-14331, NIC-8282, IS-387, G-13, EC-334955, NIC-8062, G-8, SI-1925, EC-35000, G-19, IS-90, GRT-83138, EC-303423-C, NIC-17362-A, ES-310420, IS-178-C, SI-250,
2	Resistant (R)	1.1-2	3	41	S-0481, ES-75, TILO/Hana, EC-335001-A, S-003116, NIC-16114-B, BS-61, EC-164966, KMR-90, EC-335003, IS-722-2-84-I, NIC-17477-I, 43994, Oct.-81, Ec-182832, NIC-8033, G-2, G-6, NIC-9835, IS-77, GRT-8327, S-0619, ES-131-I-84, IC-152485, IS-449, IS-150-3-84, ES-64, IC-30884 ,GRT-8359, S-0281, IS-712, GRT-83128, NIC-16218, KJS-21, NIC-14730, Juland Sahame, SI-1865-1-B, GSM-21, IS-346, S-01159-C, GRT-8336
3	Moderately resistant (MR)	2.1-3	5	47	KIS-282, G_12, IS-641-1-84, S-0273, EC-334927, NIC-161848, Ledguda, TIC-74,S-0449,S-0539,G-10,SI-1687-I, G-18, EC-334993-I, ES-110-A, NIC-8055-I, ES-139-2-84, RJS-BO ,ES-173,WLR/92/No 217/shal, IS-99-A ,SI-3275, IS-436-3-84, IS-199-2-04, EC-334967 ,SI-3315-16, IS-387-2, IS-289, EC-310455, SI-3114, EC-334969, EC-334995-1, I-68 ,IS-686, 78-266-I, TMV-12-52, KMR-48, S-0223, S-0268-C, S-0403, S-0062-A, 847-1-C, ES-742-B ,GRT-8630-C, IS-201-5, IS-8480-B, IS-552
4	Susceptible (S)	3.1-5	7	20	EC-33498,G-41,IS-972,EC303442,EC-334957, RJS-77,S0606,SI-805,IS-205-1,IS-132295,S0069,S0627,IS-446-1-84,EC-204704,IS-564,S-0210,IS-350,IS-62-1,NIC-17274-C,IS-425-C,
5	Highly Susceptible (HS)	5.1-9	9	2	IC-2621694 ,TC-25

Table 4: Resistance reaction of sesame accession against leaf webber and capsule borer, *Antigastra catalaunalis* during *kharif-2019-2020.*

Sno	% due to leaf wbber and Capsule boere , *Antigastra catlaunalis*															
		Per cent leaf damage at 30 DAS				Per cent Flower damage at 45 DAS				Per cent Capsule damage at 70 DAS				Cumulative score (A+B+C) /3	Grade	Reaction
	Germplasm	2019	2020	mean	score	2019	2020	mean	score	2019	2020	mean	score			
1	KIS-282	20.0(26.6)	20(26.6)	20.0(26.6)	3	15.0(22.8)	0.0(0.0)	7.5(11.4)	3	0.3(3.3)	5.6(13.6)	2.9(8.5)	3	3.0	5	**MR**
2	G-12	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	16.4(23.9)	2.4(9.0)	9.4(16.45)	3	0.3(3.0)	7.2(15.6)	3.7(9.3)	3	2.3	5	**MR**
3	IS-641-1-84	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.6(10.9)	1.5(7.1)	2.6(9.0)	1	1.6(7.2)	7.1(15.5)	4.4(11.35)	5	2.3	5	**MR**
4	EC-33498	0.0(0.0)	20(26.6)	10(13.3)	1	19.1(25.9)	2.7(9.5)	10.9(17.7)	5	4.4(12.2)	8(16.4)	6.2(14.3)	5	3.7	7	**S**
5	G-41	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	13.4(21.5)	2.4(8.8)	7.9(15.15)	3	2.5(9.1)	15.4(23.1)	8.9(16.1)	9	4.3	7	**S**
6	IS-972	20(26.6)	0.0(0.0)	10(13.3)	1	7.1(15.5)	9.4(17.8)	8.3(16.65)	3	6.8(15.1)	1.9(8.0)	4.3(11.35)	5	3.0	7	**S**
7	EC-303442	0.0(0.0)	20(26.6)	10(13.3)	1	1.8(7.6)	6.8(15.1)	4.3(11.35)	1	2.1(8.4)	13.7(21.7)	7.9(15.05)	7	3.0	7	**S**
8	EC-334957	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.8(7.7)	13.3(21.4)	7.6(14.55)	3	1.5(7.1)	8.3(16.8)	4.9(11.95)	5	3.0	7	**S**
9	RJS-77	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.7(9.4)	8.3(16.8)	5.5(13.1)	3	0.7(4.7)	9.8(18.3)	5.3(11.5)	5	3.0	7	**S**
10	EC334989	0.0(0.0)	20(26.6)	10(13.3)	1	0.0(0.0)	7.6(16)	3.8(8.0)	1	2(8.2)	1.5(7.0)	1.8(7.6)	1	1.0	1	**HR**
11	S-0481	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4(11.5)	6.2(14.4)	5.1(12.95)	1	1.6(7.4)	3.1(10.1)	2.4(8.8)	3	1.7	3	**R**
12	ES-75	20(26.6)	0.0(0.0)	10(13.3)	1	2.2(8.6)	5.5(13.5)	3.6(11.05)	1	0.0(0.0)	5.4(13.4)	2.7(6.7)	3	1.7	3	**R**
13	S-0273	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	7.5(15.9)	3.4(10.6)	5.5(13.25)	3	1.4(6.9)	3.2(10.3)	2.3(8.6)	3	2.3	5	**MR**
14	TILO/Hana	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.8(7.7)	3.2(10.3)	2.5(9.0)	1	1.9(7.9)	5(12.9)	3.5(10.4)	3	1.7	3	**R**
15	EC-335001-A	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.4(8.9)	6.1(14.3)	4.25(11.6)	1	2.4(8.9)	3.3(10.4)	2.9(9.65)	3	1.7	3	**R**
16	S-003116	20(26.6)	0.0(0.0)	10(13.3)	1	0.0(0.0)	4.4(12.1)	2.2(6.05)	1	0.6(4.5)	3.8(11.2)	2.2(7.85)	3	1.7	3	**R**
17	NIC-16114-B	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.1(8.3)	6(14.1)	4.05(11.2)	1	0.8(5.2)	2.7(9.5)	1.8(7.35)	3	1.7	3	**R**
18	BS-61	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4.9(12.8)	4.7(12.5)	4.8(12.65)	1	1.2(6.2)	6.7(15.0)	3.9(10.6)	3	1.7	3	**R**
19	EC-334927	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	9.7(18.2)	3.7(11)	6.7(14.6)	3	3.6(10.9)	3.8(11.3)	3.7(11.1)	3	2.3	5	**MR**
20	NIC-161848	20(26.6)	20(26.6)	20.0(26.6)	3	11.4(19.7)	4.1(11.7)	7.75(15.7)	3	0.6(4.4)	3.9(11.4)	2.3(7.9)	3	3.0	5	**MR**
21	EC-164966	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	2.5(9.1)	1.25(4.55)	1	3.6(11)	2.7(9.4)	3.15(10.2)	3	1.7	3	**R**
22	KMR-90	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.6(9.3)	0.9(5.4)	1.75(7.35)	1	0.0(0.0)	8.0(16.4)	4.0(8.2)	3	1.7	3	**R**
23	Ledguda	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4.3(12)	4.2(11.8)	4.25(11.9)	1	1.1(6.0)	11.7(20)	6.4(13)	7	3.0	5	**MR**
24	EC-335003	0.0(0.0)	20(26.6)	10(13.3)	1	3.6(10.9)	3.9(11.4)	3.8(11.15)	1	1.8(7.7)	6.7(15)	4.3(11.35)	3	1.7	3	**R**
25	TIC-74	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.7(7.5)	2.8(9.6)	2.25(8.55)	1	2.2(8.5)	13.6(21.7)	7.9(15.1)	7	3.0	5	**MR**
26	Annand local	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.6(7.2)	2.7(9.4)	2.15(8.3)	1	0.0(0.0)	2.7(9.4)	1.4(4.7)	1	1.0	1	**HR**
27	IS-722-2-84-I	20(26.6)	20(26.6)	20(26.6)	3	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.6(4.5)	0.0(0.0)	0.3(2.25)	1	1.7	3	**R**
28	S-0606	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	2.5(9.1)	1.25(4.55)	1	6.1(14.3)	28.2(32.1)	4 (8.2)	9	3.7	7	**S**
29	IS-653-A	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	8.2(16.7)	1.8(7.8)	5(12.25)	1	0.2(2.8)	3.1(10.1)	1.7(6.45)	1	1.0	1	**HR**
30	NIC-17477-I	20(26.6)	0.0(0.0)	10(13.3)	1	0.0(0.0)	3.4(10.6)	1.7 (5.3)	1	0.0(0.0)	8(16.4)	4.0(8.2)	3	1.7	3	**R**
31	43994	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4.2(11.9)	2.7(9.5)	3.45(10.7)	1	1.9(8.0)	4.2(11.9)	3.1(9.95)	3	1.7	3	**R**
32	S-0449	0.0(0.0)	20(26.6)	10(13.3)	1	2.8(9.7)	2.7(9.4)	2.75(9.55)	1	3.3(10.5)	7.4(15.8)	5.4(13.15)	5	2.3	5	**MR**

33	NIL-16426	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.9(7.9)	4.9(12.8)	3.4(10.35)	1	0.9(5.3)	0.0(0.0)	0.5(2.65)	1	1.0	1	**HR**
34	S-0539	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.5(9.1)	3.9(11.4)	3.2(10.25)	1	3.4(10.6)	11.1(19.5)	7.3(15.1)	7	3.0	5	**MR**
35	G-10	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.1(8.3)	3.3(10.5)	2.7(9.40)	1	2.3(8.7)	7.5(15.9)	4.9(12.3)	5	2.3	5	**MR**
36	SI-1687-I	20(26.6)	20(26.6)	20(26.6)	3	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.9(5.4)	8(16.4)	4.5(10.)	5	3.0	5	**MR**
37	IC-14331	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.3(8.8)	2.3(8.7)	2.3(8.75)	1	1.7(7.5)	0.0(0.0)	0.9(3.8)	1	1.0	1	**HR**
38	Oct.-81	20(26.6)	20(26.6)	20(26.6)	3	0.0(0.0)	1.8(7.7)	0.9(3.85)	1	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.7	3	**R**
39	Ec-182832	20(26.6)	0.0(0.0)	10(13.3)	1	10.9(19.2)	0.0(0.0)	5.45(9.60)	3	0.7(4.8)	0.0(0.0)	0.4(2.4)	1	1.7	3	**R**
40	G-18	0.0(0.0)	20(26.6)	10(13.3)	1	12.8(21)	0.0(0.0)	6.4(10.50)	3	0.7(4.9)	10(18.4)	5.4(11.65)	5	3.0	5	**MR**
41	NIC-8033	20(26.6)	00(0)	10(13.3)	1	0.0(0.0)	3.5(10.8)	1.75(5.4)	1	0.9(5.4)	6.7(15)	3.8(10.2)	3	1.7	3	**R**
42	SI-805	0.0(0.0)	40(39.2)	20(19.6)	3	4.3(12)	0.0(0.0)	2.15(6.0)	1	0.0(0.0)	16(23.6)	8.0(11.5)	7	3.7	7	**S**
43	G-2	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	16.1(23.7)	0.0(0.0)	8.1(11.85)	3	1.9(7.9)	0.0(0.0)	0.9(3.95)	1	1.7	3	**R**
44	G-6	0.0(0.0)	20(26.6)	10(13.3)	1	0.0(0.0)	3.3(10.5)	1.65(5.25)	1	5.3(13.3)	2.7(9.4)	4.0(11.4)	3	1.7	3	**R**
45	NIC-8282	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.2(8.6)	0.0(0.0)	1.1(4.3)	1	0.4(3.4)	0.0(0.0)	0.2(1.7)	1	1.0	1	**HR**
46	IS-387	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	3.6(11)	1.8(5.5)	1	0.4(3.7)	3.1(10.1)	1.8(6.9)	1	1.0	1	**HR**
47	G-13	0.0(0.0)	20(26.6)	10(13.3)	1	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	1.9(7.9)	0.9(3.95)	1	1.0	1	**HR**
48	EC-334955	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	2.4(8.9)	1.2(4.45)	1	0.3(3.4)	2.8(9.7)	1.6(6.55)	1	1.0	1	**HR**
49	IS-205-I	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	5(12.9)	20(26.6)	12.5(19.8)	5	5.2(13.2)	10(18.4)	7.6(15.8)	7	4.3	7	**S**
50	NIC-8062	0.0(0.0)	20(26.6)	10(13.3)	1	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.4(10.6)	0.0(0.0)	1.7(5.3)	1	1.0	1	**HR**
51	G-8	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	2.7(9.4)	1.35(4.7)	1	0.8(5.1)	4(11.5)	2.4(8.3)	1	1.0	1	**HR**
52	SI-1925	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	4(11.5)	2(5.75)	1	0.0(0.0)	2.2(8.5)	1.1(4.25)	1	1.0	1	**HR**
53	EC-35000	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.4(10.7)	2.4(8.9)	2.9(9.8)	1	0.9(5.5)	0.0(0.0)	0.5(2.75)	1	1.0	1	**HR**
54	NIC-9835	0.0(0.0)	20(26.6)	10(13.3)	1	0.0(0.0)	3.9(11.4)	1.95(5.7)	1	0.7(4.9)	7.7(16.1)	4.2(10.5)	3	1.7	3	**R**
55	IS-77	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	4.4(12.1)	2.2(6.05)	1	0.9(5.4)	6.3(14.5)	3.6(9.95)	3	1.7	3	**R**
56	EC-334993-I	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.7(9.4)	2.7(9.5)	2.7(9.45)	1	1.3(6.6)	12.5(20.7)	6.9(13.6)	7	3.0	5	**MR**
57	ES-110-A	0.0(0.0)	20(26.6)	10(13.3)	1	4.9(12.8)	2.4(8.8)	3.65(10.8)	3	1.9(7.9)	9.4(17.8)	5.7(12.85)	5	3.0	5	**MR**
58	GRT-8327	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.1(10.2)	7.5(15.9)	5.3(13.05)	3	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.7	3	**R**
59	NIC-8055-I	20(26.6)	0.0(0.0)	10(13.3)	1	8.5(17)	2.6(9.3)	5.6(13.15)	3	0.8(5.3)	7.9(16.3)	4.4(10.8)	3	2.3	5	**MR**
60	S-0619	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.3(6.6)	4.7(12.8)	3(9.55)	1	0.4(3.5)	8.3(16.8)	4.4(10.15)	3	1.7	3	**R**
61	IS-132295	0.0(0.0)	20(26.6)	10(13.3))	1	54.1(47.3)	2.1(8.3)	28.1(27.8)	8	0.0(0.0)	8.1(16.5)	4.1(8.25)	3	4.0	7	**S**
62	ES-131-I-84	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	11.3(19.6)	2.6(9.2)	6.95(14.4)	3	0.0(0.0)	2.9(9.9)	1.5(4.95)	1	1.7	3	**R**
63	S-0069	20(26.6)	0.0(0.0)	10(13.3)	1	2.1(8.2)	4.4(12.7)	3.25(10.2)	1	2.9(9.7)	20(26.6)	11.5(18.1)	9	3.7	7	**S**
64	ES-139-2-84	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	14.9(22.7)	3(10)	8.9(16.4)	3	1(5.7)	9.1(17.5)	5.1(11.6)	5	3.0	5	**MR**
65	RJS-BO	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	10.9(19.3)	5.9(14)	8.4(16.65)	3	2.8(9.6)	8(16.4)	5.4(13)	5	3.0	5	**MR**
66	S-0627	20(26.6)	0.0(0.0)	10(13.3)	1	6.9(15.3)	4.5(12.3)	5.7(13.8)	3	1.2(6.4)	12.5(20.7)	6.9(13.55)	7	3.7	7	**S**
67	IC-152485	0.0(0.0)	0.0(0.0	0.0(0.0	1	7.3(15.6)	10.2(18.6)	8.75(17.1)	3	0.4(3.6)	0.0(0.0)	0.2(1.8)	1	1.7	3	**R**
68	ES-173	0.0(0.0)	20(26.6)	10(13.3)	1	8.6(17.1)	9.3(17.7)	8.95(17.4)	3	0.0(0.0)	10(18.4)	5(9.2)	5	3.0	5	**MR**
69	WLR/92/No 217/shal	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	5.9(14)	8(16.4)	6.95(15.2)	3	0.4(3.6)	9.4(17.8)	4.9(10.7)	5	3.0	5	**MR**
70	IS-99-A	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.9(11.5)	5.2(13.1)	4.55(12.3)	3	0.0(0.0)	6.5(14.8)	3.(7.4)	3	2.3	5	**MR**
71	SI-3275	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.9(11.4)	10.3(18.8)	7.1(15.1)	3	1.1(6)	6.3(14.5)	3.7(10.3)	3	2.3	5	**MR**
72	IS-436-3-84	0.0(0.0)	40(26.6)	20(19.6)	3	2.9(9.7)	14.6(22.5)	8.75(16.1)	3	0.7(4.9)	0.0(0.0)	0.4(2.45)	1	2.3	5	**MR**

73	IS-449	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	9.4(17.8)	3.3()	6.35(14.2)	3	1.4(6.7)	0.0(0.0)	0.7(3.35)	1	1.7	3	**R**
74	IS-199-2-04	0.0(0.0	40(39.2)	20(19.6)	3	2.7(9.5)	4.3()	3.5(10.75)	1	0.4(3.8)	6.1(14.3)	3.3(9.05)	3	2.3	5	**MR**
75	EC-334967	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	13.3(21.4)	1.5()	7.4(14.25)	3	0.0(0.0)	9.4(17.9)	4.7(8.9)	5	3.0	5	**MR**
76	IS-150-3-84	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0(0.0)	10.9()	5.45(9.6)	3	0.4(3.8)	0.0(0.0)	0.2(1.9)	1	1.7	3	**R**
77	SI-3315-16	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	13.6(21.7)	20.8()	17.2(24.5)	5	2.5(9.31)	0.0(0.0)	1.3(4.5)	1	2.3	5	**MR**
78	IC-2621694	20(26.6)	20(26.6)	20(26.6)	3	4.5(12.3)	17.1()	10.8(18.4)	5	1.4(6.7)	16.1(23.7)	8.8(15.2)	9	5.7	9	**HS**
79	IS-387-2	0.0(0.0)	20(26.6)	10(13.3)	1	3.3(10.4)	7.1()	5.2(12.95)	3	1.3(6.6)	10.3(18.8)	5.8(12.7)	5	3.0	5	**MR**
80	IS-289	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	15.2()	7.6(11.45)	3	1.9(7.9)	8.3(16.8)	5.1(12.3)	5	3.0	5	**MR**
81	IS-446-1-84	20(26.6)	40(39.2)	30(32.9)	5	0.0(0.0)	3.3()	1.65(5.25)	1	2(8.2)	9.1(17.5)	5.6(12.8)	5	3.7	7	**S**
82	G-19	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	5.1(13)	2.6(6.5)	1	0(0.0)	2.7(9.5)	1.4(4.75)	1	1.0	1	**HR**
83	EC-310455	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	7.1(15.5)	7.1(15.5)	7.1(15.5)	3	1.7(7.5)	8(16.4)	4.9(11.9)	3	2.3	5	**MR**
84	SI-3114	0.0(0.0)	40(39.2)	20(19.6)	3	6.9(15.2)	5(12.9)	5.95(14.1)	3	0.8(5.2)	2.7(9.4)	1.8(7.3)	1	2.3	5	**MR**
85	EC-334969	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	35.2(36.4)	0(0.0)	17.6(18.2)	7	0.9(5.4)	0.0(0.0)	0.5(2.7)	1	3.0	5	**MR**
86	EC-204704	20(26.6)	20(26.6)	20(26.6)	3	28.1(32)	7.7(16.1)	17.9(24.1)	7	0.4(3.8)	4.5(12.2)	2.5(8.0)	3	4.3	7	**S**
87	EC-334995-1	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	8.9(17.3)	17.1(24.5)	13(20.9)	5	0.8(5)	4(11.5)	2.4(8.25)	3	3.0	5	**MR**
88	ES-64	20(26.6)	0.0(0.0)	10(13.3)	1	9.3(17.7)	10(18.4)	9.7(18.1)	3	1.7(7.4)	2(8.1)	1.9(7.7)	1	1.7	3	**R**
89	IS-564	20(26.6)	40(39.2)	30(32.9)	5	10.4(18.8)	6.8(15.1)	8.6(16.98)	3	2.3(8.7)	3.9(11.5)	3.1(10.1)	3	3.7	7	**S**
90	S-0210	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	38(38.0)	0.0(0.0)	19(19.0)	7	1.8(7.8)	7.1(15.4)	4.5(11.6)	3	3.7	7	**S**
91	IS-350	0.0(0.0)	20(26.6)	10(13.3)	1	9.1(9.5)	22(27.9)	15.6(22.7)	7	4.1(11.7)	3.9(11.4)	4(11.55)	3	3.7	7	**S**
92	IC-30884	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.2(8.6)	3.4(10.7)	2.8(9.65)	1	2.5(9.1)	2.9(9.9)	2.7(9.5)	3	1.7	3	**R**
93	IS-90	0.0(0.0)	20(26.6)	10(13.3)	1	0(0.0)	5.1(13)	2.6(6.5)	1	0.4(3.4)	0.0(0.0)	0.2(1.7)	1	1.0	1	**HR**
94	GRT-8359	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	14(22.0)	3.9(11.4)	8.9(16.7)	3	0.0(0.0)	1.8(7.7)	0.9(3.85)	1	1.7	3	**R**
95	I-68	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	12.2(20.5)	6.1(10.25)	3	2.3(8.8)	6.2(14.4)	4.3(11.6)	3	2.3	5	**MR**
96	IS-686	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	6.2(14.4)	9(17.5)	7.6(15.95)	3	1.2(6.3)	3.3(10.5)	2.3(8.4)	3	2.3	5	**MR**
97	78-266-I	0.0(0.0)	20(26.6)	10(13.3)	1	5(12.9)	7.8(16.2)	6.4(14.55)	3	0.6(4.5)	9(17.4)	4.8(10.9)	5	3.0	5	**MR**
98	S-0281	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	11.3(19.6)	0.0(0.0)	5.65(9.8)	3	0.0(0.0)	3.1(10.1)	1.6(5.05)	1	1.7	3	**R**
99	TMV-12-52	20(26.6)	40(39.2)	30(32.9)	5	14.1(22)	4.7(12.5)	9.4(17.25)	3	3.4(10.6)	0.0(0.0)	1.7(5.3)	1	3.0	5	**MR**
100	IS-712	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.8(5.0)	10(18.4)	5.4(11.7)	3	2.1(8.3)	0.0(0.0)	1.05(4.15)	1	1.7	3	**R**
101	GRT-83128	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	11(19.6)	8.1(16.5)	9.5(17.9)	3	1.8(7.8)	2.9(9.9)	2.4(8.85)	1	1.7	3	**R**
102	NIC-16218	0.0(0.0)	20(26.6)	10(13.3)	1	6.6(14.8)	6.1(14.3)	6.3(14.55)	3	0.5(4)	1(5.7)	0.8(4.85)	1	1.7	3	**R**
103	KJS-21	20(26.6)	0.0(0.0)	10(13.3)	1	5.1(19.8)	10.4(18.8)	7.8(15.9)	3	1.7(7.5)	2.2(8.6)	1.9(8.05)	1	1.7	3	**R**
104	KMR-48	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4.9(12.8)	8.6(17)	6.75(14.9)	3	2.5(9.1)	8(16.5)	5.3(12.8)	5	3.0	5	**MR**
105	NIC-14730	0.0(0.0)	20(26.6)	10(13.3))	1	6.2(14.4)	13.1(21.2)	9.65(17.8)	3	0.0(0.0)	3(10.0)	1.5(5.0)	1	1.7	3	**R**
106	GRT-83138	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4(11.5)	2.9(9.8)	3.5(10.65)	1	0.0(0.0)	3.6(10.9)	1.8(5.5)	1	1.0	1	**HR**
107	S-0223	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	25(30.0)	15.9(23.5)	20.5(26.8)	7	0.0(0.0)	5.6(13.6)	2.8(6.8)	1	3.0	5	**MR**
108	IS-62-I	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	52.6(46.5)	6.6(14.9)	29.6(30.7)	8	1.3(6.5)	0.0(0.0)	0.65(3.3)	1	3.3	7	**S**
109	S-0268-C	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	18.8(25.7)	1.6(7.3)	10.2(16.5)	5	2.2(8.6)	1.5(7.1)	1.9(7.8)	1	2.3	5	**MR**
110	EC-303423-C	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	5.6(13.6)	0.0(0.0)	2.8(6.8)	1	1.6(7.4)	0.0(0.0)	0.8(3.7)	1	1.0	1	**HR**
111	S-0403	0.0(0.0)	40(39.2)	20(19.6)	3	9.3(17.8)	8.3(16.8)	8.8(17.3)	3	0.3(3.2)	6.7(15)	3.5(9.1)	3	3.0	5	**MR**
112	Juland Sahame	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	4.6(12.4)	7(15.3)	5.8(13.85)	3	0.4(3.7)	0.0(0.0)	0.2(1.85)	1	1.7	3	**R**

113	SI-1865-1-B	0.0(0.0)	40(39.2)	20(19.6)	3	3.5(10.7)	4.3(12)	3.9(11.35)	1	1(5.7)	2.8(9.7)	1.9(7.7)	1	1.7	3	**R**
114	GSM-21	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	8.8(26.3)	0.0(0.0)	4.4(13.15)	1	0.7(4.8)	7.1(15.5)	3.9(10.2)	3	1.7	3	**R**
115	NIC-17362-A	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.2(10.2)	0.0(0.0)	1.6(5.1)	1	1.2(6.3)	3.1(10.1)	2.2(8.2)	1	1.0	1	**HR**
116	S-0062-A	0.0(0.0)	40(39.2)	20(19.6)	3	6.4(14.6)	8.6(17)	7.5(15.8)	3	0.6(4.6)	7.1(15.5)	3.85(10.1)	3	3.0	5	**MR**
117	IS-346	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.6(9.3)	10(18.4)	6.3(13.9)	3	1.6(7.2)	0.0(0.0)	0.8(3.6)	1	1.7	3	**R**
118	NIC-17274-C	0.0(0.0)	20(26.6)	10(13.3)	1	2.9(9.9)	9(17.4)	5.9(13.7)	3	0.0(0.0)	15.4(23.1)	7.7(11.35)	7	3.7	7	**S**
119	S-01159-C	20(26.6)	0.0(0.0)	10(13.3)	1	11(19.4)	7.1(15.5)	9.1(17.45)	3	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.7	3	**R**
120	847-1-C	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	8.9(17.3)	13.8(21.8)	11.4(19.6)	5	0.0(0.0)	1.9(8.0)	0.95(4)	1	2.3	5	**MR**
121	ES-742-B	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	11.6(19.9)	10.3(18.8)	10.9(19.4)	5	1.5(6.9)	0.9(5.4)	1.2(6.15)	1	2.3	5	**MR**
122	GRT-8630-C	0.0(0.0)	20(26.6)	10(13.3)	1	2.4(8.8)	6.3(14.5)	4.4(11.65)	1	1.5(7.0)	9.5(17.9)	5.5(12.45)	5	2.3	5	**MR**
123	GRT-8336	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	3.4(10.7)	8.9(17.4)	6.2(14.05)	3	0.9(5.5)	2.5(9.2)	1.7(7.35)	1	1.7	3	**R**
124	IS-201-5	0.0(0.0)	20(26.6)	10(13.3)	1	3.1(10.1)	12.5(20.7)	7.8(15.4)	3	2.6(9.3)	8.1(16.5)	5.35(12.9)	5	3.0	5	**MR**
125	ES-310420	20(26.6)	0.0(0.0)	10(13.3)	1	2.2(8.5)	7.1(15.5)	4.65(12.0)	1	0.0(0.0)	2.4(8.9)	1.2(4.45)	1	1.0	1	**HR**
126	IS-425-C	40(39.2)	40(39.2)	40(39.2)	7	13.2(21.3)	0.0(0.0)	6.6(10.65)	3	2.2(8.6)	4.6(12.4)	3.4(10.5)	3	4.3	7	**S**
127	IS-8480-B	0.0(0.0)	20(26.6)	10(13.3)	1	11(19.4)	0.0(0.0)	5.5(9.7)	3	1(5.7)	8.2(16.7)	4.6(11.2)	5	3.0	5	**MR**
128	IS-552	0.0(0.0)	20(26.6)	10(13.3)	1	8.5(16.9)	15(22.8)	11.8(19.9)	5	2.3(8.8)	2.5(9.0)	2.4(8.9)	1	2.3	5	**MR**
129	IS-178-C	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	1.0	1	**HR**
130	TC-25 (SC)	40(39.2)	40()39.2	40(39.2)	5	18.4(25.4)	13.3(21.4)	15.9(23.4)	7	5.5(12.9)	6.8(15.1)	6.15(13.8)	7	7.0	9	**HS**
131	SI-250(RC)	0.0(0.0)	0.0(0.0)	0.0(0.0)	1	2.6(9.3)	0.0(0.0)	1.3(4.65)	1	0(1.1)	0.8(5.0)	0.4(3.05)	1	1.0	1	**HR**

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