Screening of cowpea germplasm against cowpea aphid (*Aphis craccivora* Koch,1854) under artificial conditions

ABSTRACT

The study was carried out during 2022-23 at the glasshouse complex in ICAR-National Bureau of Plant Genetic Resources, Regional Station, Rajendranagar, Hyderabad, to evaluate the resistance or susceptibility of cowpea genotypes against cowpea aphid, *A.craccivora*in artificial conditions. 109 genotypescategorized as resistant (R) or moderately resistant (MR)(selected from field experiments) and along with a check C-152 were subjected to artificially controlled aphid infestation in a glass house complex.None exhibited resistance based on aphid damage scores 1 to 5 after 21 days of infestation. Nevertheless, nine genotypes (IC372724, IC401381, IC372726, IC399000, IC400103, IC415590, IC420467, IC426812, and NBGP8/03(C-715) were considered moderately resistant, 61 genotypes and check C 152 were susceptible and thirty-nine genotypes were classified highly susceptible.

Key words: Cowpea, *Aphis craccivora*, NBPGR, Glass house.

1.INTRODUCTION

Cowpea (*Vigna unguiculata* L. Walp) stands out as a crucial pulse crop, particularly insub-Saharan Africa and globally, due to its remarkable nutritional value and ability to thrive under harsh conditions such as drought and heat(Egho, 2010; Boukar*et al*., 2013; Singh, 2014; Togola *et al*., 2017). Its protein content reaches an impressive 28%, accompanied by essential minerals like magnesium and calcium as well as beneficial vitamins A and B6 (Gerrano*et al.,* 2019).Cowpea has been considered as a neglected crop species being underutilized in the past (Mabhaudhi*et al*., 2017) and currently, its potential has been recognized and needs to be unleashed. In the Indian context too, it is a minor pulse cultivated mainly in arid and semi-arid tracts of India. Cowpea is grown in an area of 15,828 acres with a yield of 334 kg/acre and production of 5,287 MT (Anonymous, 2022b).

cowpea aphid, *Aphis craccivora*, is indeed a significant pest for cowpea crops, causing substantial yield losses by directly altering plant metabolism and extracting nutrients, as well as indirectly transmitting harmful viruses(Blackman and Eastop, 2000) (Thottapilly*et al*., 1990) This pest has become a major concern in cowpea-growing regions across Africa, Asia and the America(Obeng-Ofori, 2007;Omoigui*et al*., 2017; Ouedraogo *et al*., 2018).Efforts to combat this pest have included exploring host plant resistanceand offring an environmentally friendly control approach. Various studies have identified cowpea lines with different levels of resistance to aphids. However, the emergence of resistance-breaking biotypes underscores the need for continued research and development of new resistant sources. (Kusi *et al.*, 2010; Souleymane *et al*., 2013; Aliyu and Ishiyaku, 2013;Omoigui*et al*., 2017).Genetic studies have also been conducted to understand the inheritance of aphid resistance in cowpea(Bata *et al*., 1987; Smith and Chuang, 2014;Huynh *et al*., 2015). While these studies have provided valuable insights, the results have varied, raising questions about the precise mode of inheritance. Therefore, further exploration of resistance mechanisms and identification of additional sources of resistance are crucial to enhance our understanding and develop more effective strategies against cowpea aphids by continuing to investigate genetic factors underlying resistance and screening for new resistant varieties, researchers can contribute to the sustainable management of cowpea aphids and reduce the risk of resistance breakdown in affected regions.

2. MATERIALS AND METHODS

The experiment was conducted in a glasshouse facility at ICAR-National Bureau of Plant Genetic Resources, Regional Station, Hyderabad.A total of 109 selected genotypes and check C 152 were planted in plastic nursery pots with a diameter of 30 cm and a depth of 25 cm.Five seeds were sown at equal distances for each genotype in each pot and replicated three times using a Completely randomized design (CRD).The plants were carefully monitored daily for growth and irrigation was provided as needed. To ensure the plants' protection, they were kept free from aphid predators throughout duration of 21 days. At 7 days after planting, five 4^{th} instar (apterous) aphids were transferred carefullyon every plant of each genotype with the help of camel hair brush to reduce mechanical injury on the insect. All aphids used in the experiment were taken from the same culture.

An Aphid culture was established by collecting a colony of *A.craccivora* from a cowpea field at NBPGR, Regional Station, Hyderabad. To protect the colony from predators and parasitoids, it was maintained in insect-proof cages. The rearing process involved using two-week-old seedlings of the susceptible C 152 genotype, which were planted every two weeks in new cages to ensure a continuous supply of aphids throughout the study period.

Counting of aphid population and scoring for the aphid damage per plant were carried out for each cowpea genotype during the 21-day screening. Plant damage scoring based on symptoms caused by aphids was done using a scale of 1-5 as described by Omoigui*et al.* (2017) (Table 1) at 7, 14 and 21 days after infestation. The data collected from the study were subjected to analyses of variance (ANOVA) for the test of significance at a 5.0% level. The mean level of aphid infestation scores of each genotype was calculated by using SPSS statistical software and means were separated using Duncan's multiple - range test (DMRT).

Score	Description	Reaction
1	No symptom of attack	Resistant
2	Plant showing little symptom- Seedling slightly stunted	Moderately resistant
3	Plant showing symptoms of attack- Seedling slightly stunted with slight yellowing of older leaves	Moderately Susceptible
4	Plant showing weak stem, leaves and seedling damage- Seedling moderately stunted with yellowing of older leaves and curling of young leaves	Susceptible
5	Severely stunted seedling with severely curled and yellow leaves, stem and leaves covered with sooty mould or dead seedling	Highly susceptible

Table 1: Cowpea aphid damage rating scale (Omoigui*et al*., 2017)

3. RESULTS AND DISCUSSIONS

Cowpea genotypes were scored for aphid damage at 7, 14, and 21 days after aphid infestation on a scale of 1 to 5 as suggested by Omoigui*et al*. (2017). Results of aphid damage score on cowpea genotypes are depicted in Table1. Thecowpea aphiddamagescoreon different cowpea genotypes ranged from 1 to 1.8 at 7 days after infestation. The lowest damage score 1.00 was recorded in EC93086, EC101981, IC331106, IC372724, IC372726, IC400103, IC420467, IC519708, NBGP8/03(C-715), NR-18-75, EC38214, IC39930, IC202780 and

S.No	Genotype	7 DAI	14 DAI	21 DAI	Pooled Mean
1	EC5269	1.20^{fg}	4.00^{efghij}	4.80^{abcd}	$3.33^{hijklmno}$
2	EC43203	1.20^{fg}	3.73^{ijklmn}	4.67^{abcdef}	3.20^{mnopq}
3	EC93086	1.00^{h}	3.73^{ijklmn}	4.67^{abcdef}	3.13^{pq}
4	EC96654	1.07^{gh}	4.07^{defghi}	4.53^{cdefgh}	3.22^{lmnopq}
5	EC98661	1.20^{fg}	3.67^{jklmno}	4.67^{abcdef}	3.18^{nopq}
6	EC101981	1.00^{h}	3.93^{fghijk}	4.47^{defghi}	3.13^{pq}
7	EC219922	1.40^{de}	3.80^{hijklm}	4.80^{abcd}	$3.33^{hijklmno}$
8	EC240829	1.40^{de}	3.80^{hijklm}	5.00^{a}	$3.40^{fghijkl}$
9	EC240862	1.40^{de}	3.47^{mnop}	5.00^{a}	$3.29^{jklmnopq}$
10	EC240930	1.53^{bc}	4.33^{abcde}	5.00^{a}	3.62^{abcd}
11	EC240979	1.20^{fg}	3.67^{jklmno}	5.00^{a}	$3.29^{jklmnopq}$
12	EC240983	1.20^{fg}	3.60^{klmno}	4.80^{abcd}	3.20^{mnopq}
13	EC243939	1.27^{ef}	3.53^{lmno}	4.80^{abcd}	3.20^{mnopq}
14	EC243943	1.40^{de}	3.33^{op}	4.67^{abcdef}	3.13^{pq}
15	EC243999	1.60^{b}	3.67^{jklmno}	4.73^{abcde}	$3.33^{hijklmno}$
16	EC244047	1.20^{fg}	3.40^{nop}	4.93^{ab}	3.18^{nopq}
17	EC244057	1.53^{bc}	4.20^{bcdefg}	5.00^{a}	3.58^{abcde}
18	EC244065	1.07^{gh}	3.53^{lmno}	4.73^{abcde}	3.11^{q}
19	EC244074	1.20^{fg}	3.13^{p}	5.00^{a}	3.11^{q}
20	EC244077	1.47^{cd}	4.53^{ab}	5.00^{a}	3.67^{ab}
21	EC244134	1.40^{de}	4.27^{bcdef}	4.67^{abcdef}	$3.44^{efghijk}$
22	IC342702	1.40^{de}	4.67^{a}	5.00^{a}	3.69^{a}
23	IC601541	1.47^{cd}	4.13^{cdefgh}	4.40^{efghi}	$3.33^{hijklmno}$
24	IC606653	1.53^{bc}	4.40^{abcd}	5.00^{a}	3.64^{abc}
25	IC610281	1.40^{de}	3.33^{op}	5.00^{a}	3.24^{lmnopq}
26	IC626167	1.20^{fg}	4.13^{cdefgh}	4.53^{cdefgh}	$3.29^{jklmnopq}$
27	NIC15346	1.20^{fg}	3.47^{mnop}	4.73^{abcde}	3.13^{pq}
28	IC257211	1.33^{de}	3.47^{mnop}	4.80^{abcd}	3.20^{mnopq}
29	IC311918	1.33^{de}	3.73^{ijklmn}	5.00^{a}	$3.36^{ghijklmn}$
30	IC472264	1.40^{de}	3.73^{ijklmn}	4.33^{fghi}	3.16^{opq}
31	IC331106	1.00^{h}	3.67^{jklmno}	4.67^{abcdef}	3.11^{q}

32	IC331708	1.47^{cd}	3.67^{jklmno}	5.00^{a}	$3.38^{fghijklm}$
33	IC334368	1.20^{fg}	4.27^{bcdef}	5.00^{a}	$3.49^{cdefghi}$
34	IC548860	1.20^{fg}	4.27^{bcdef}	4.93^{ab}	$3.47^{defghij}$
35	IC353873	1.40^{de}	4.07^{defghi}	4.93^{ab}	$3.47^{defghij}$
36	IC372722	1.27^{ef}	3.47^{mnop}	5.00^{a}	3.24^{lmnopq}
37	IC372724	1.00^{h}	1.87^{t}	2.67^{lm}	1.84^{t}
38	IC372726	1.00^{h}	2.20^{st}	2.93^{jkl}	2.07^{s}
39	IC385869	1.20^{fg}	3.80^{hijklm}	4.53^{cdefgh}	3.18^{nopq}
40	IC397618	1.20^{fg}	3.73^{ijklmn}	4.67^{abcdef}	3.20^{mnopq}
41	IC399000	1.20^{fg}	1.94^{t}	2.87^{jkl}	2.03^{s}
42	IC400103	1.00^{h}	2.47^{rs}	2.67^{lm}	2.04^{s}
43	IC401381	1.07^{gh}	2.13^{t}	2.73^{klm}	1.98^{st}
44	IC415416	1.07^{gh}	3.67^{jklmno}	4.67^{abcdef}	3.13^{pq}
45	IC415590	1.13^{fg}	2.00^{t}	2.90^{jkl}	2.02^{s}
46	IC420467	1.00^{h}	2.67^{qr}	2.47^{m}	2.06^{s}
47	IC338514	1.53^{bc}	3.47^{mnop}	4.40^{efghi}	3.13^{pq}
48	IC426812	1.07^{gh}	2.13^{t}	2.93^{jkl}	2.04^{s}
49	IC427586	1.47^{cd}	3.60^{klmno}	4.33^{fghi}	3.13^{pq}
50	IC436623	1.20^{fg}	3.80^{hijklm}	4.47^{defghi}	3.16^{opq}
51	IC488259	1.40^{de}	3.40^{nop}	4.53^{cdefgh}	3.11^{q}
52	IC519708	1.00^{h}	3.40^{nop}	5.00^{a}	3.13^{pq}
53	EC517137	1.20^{fg}	4.00^{efghij}	4.20^{hi}	3.13^{pq}
54	IC546503	1.53^{bc}	3.53^{lmno}	4.27^{ghi}	3.11^{q}
55	IC546519	1.40^{de}	3.73^{ijklmn}	4.60^{bcdefg}	3.24^{lmnopq}
56	IC546523	1.33^{de}	3.40^{nop}	4.73^{abcde}	3.16^{opq}
57	GP70(C-845)	1.47^{cd}	4.13^{cdefgh}	5.00^{a}	$3.53^{abcdefg}$
58	GP126/03(C-939)	1.20^{fg}	3.87^{ghijkl}	4.60^{bcdefg}	3.22^{lmnopq}
59	GP315/03(C-1254)	1.20^{fg}	3.60^{klmno}	5.00^{a}	$3.27^{klmnopq}$
60	NBGP8/03(C-715)	1.00^{h}	2.80^{q}	2.96^{jkl}	2.26^{r}
61	NR-18-75	1.00^{h}	3.73^{ijklmn}	4.80^{abcd}	3.18^{nopq}
62	EC38214	1.00^{h}	4.33^{abcde}	4.80^{abcd}	$3.38^{fghijklm}$
63	EC109493/2744-1	1.47^{cd}	3.73^{ijklmn}	4.73^{abcde}	$3.31^{ijklmnop}$

64	IC39930	1.00^{h}	4.13^{cdefgh}	4.80^{abcd}	3.31^{ijklmnop}
65	IC53351	1.20^{fg}	4.00^{efghij}	4.87^{abc}	3.36^{ghijklmn}
66	IC63390	1.20^{fg}	3.53^{lmno}	4.60^{bcdefg}	3.11^{q}
67	IC91476	1.40^{de}	4.20^{bcdefg}	5.00^{a}	3.53^{abcdefg}
68	IC137285	1.53^{bc}	3.93^{fghijk}	4.93^{ab}	3.47^{defghij}
69	IC201097	1.07^{gh}	4.13^{cdefgh}	5.00^{a}	3.40^{fghijkl}
70	IC202780	1.00^{h}	3.73^{ijklmn}	4.67^{abcdef}	3.13^{pq}
71	IC202856	1.53^{bc}	3.87^{ghijkl}	5.00^{a}	3.47^{defghij}
72	IC202938	1.47^{cd}	4.27^{bcdef}	4.67^{abcdef}	3.47^{defghij}
73	IC206240	1.00^{h}	3.73^{ijklmn}	4.73^{abcde}	3.16^{opq}
74	IC209139	1.47^{cd}	3.80^{hijklm}	4.67^{abcdef}	3.31^{ijklmnop}
75	IC209144	1.33^{de}	3.67^{jklmno}	4.47^{defghi}	3.16^{opq}
76	IC257430	1.40^{de}	4.40^{abcd}	5.00^{a}	3.60^{abcde}
77	IC259075	1.40^{de}	4.20^{bcdefg}	5.00^{a}	3.53^{abcdefg}
78	IC326997	1.40^{de}	4.67^{a}	5.00^{a}	3.69^{a}
79	IC369857	1.40^{de}	4.07^{defghi}	5.00^{a}	3.49^{cdefghi}
80	IC471384	1.40^{de}	3.60^{klmno}	4.60^{bcdefg}	3.20^{mnopq}
81	IC488271	1.60^{b}	3.67^{jklmno}	4.60^{bcdefg}	3.29^{jklmnopq}
82	EC724717	1.40^{de}	3.93^{fghijk}	5.00^{a}	3.44^{efghijk}
83	IC202837	1.20^{fg}	4.47^{abc}	5.00^{a}	3.56^{abcdef}
84	IC398031	1.20^{fg}	3.87^{ghijkl}	4.67^{abcdef}	3.24^{lmnopq}
85	EC107191	1.20^{fg}	4.40^{abcd}	4.93^{ab}	3.51^{bcdefgh}
86	EC240702	1.53^{bc}	4.13^{cdefgh}	5.00^{a}	3.56^{abcdef}
87	EC738083	1.60^{b}	3.60^{klmno}	4.13^{i}	3.11^{q}
88	EC738089	1.40^{de}	3.80^{hijklm}	5.00^{a}	3.40^{fghijkl}
89	EC738091	1.33^{de}	3.73^{ijklmn}	5.00^{a}	3.36^{ghijklmn}
90	EC738092	1.20^{fg}	4.00^{efghij}	5.00^{a}	3.40^{fghijkl}
91	IC738093	1.60^{b}	4.47^{abc}	5.00^{a}	3.69^{a}
92	EC738277	1.60^{b}	4.13^{cdefgh}	5.00^{a}	3.58^{abcde}
93	EC107163	1.60^{b}	4.13^{cdefgh}	5.00^{a}	3.58^{abcde}
94	EC367698	1.20^{fg}	4.33^{abcde}	5.00^{a}	3.51^{bcdefgh}
95	EC724160	1.53^{bc}	3.53^{lmno}	4.47^{defghi}	3.18^{nopq}

96	EC724261	1.60^{b}	3.53^{lmno}	4.27^{ghi}	3.13^{pq}
97	EC724874	1.40^{de}	4.47^{abc}	5.00^{a}	3.62^{abcd}
98	EC738088	1.47^{cd}	3.47^{mnop}	5.00^{a}	$3.31^{ijklmnop}$
99	EC738128	1.33^{de}	4.13^{cdefgh}	4.87^{abc}	$3.44^{efghijk}$
100	EC738154	1.20^{fg}	3.93^{fghijk}	4.53^{cdefgh}	3.22^{lmnopq}
101	EC738260	1.40^{de}	4.27^{bcdef}	4.80^{abcd}	$3.49^{cdefghi}$
102	IC622602	1.80^{a}	3.40^{nop}	4.20^{hi}	3.13^{pq}
103	SG/KT/48	1.20^{fg}	3.73^{ijklmn}	5.00^{a}	$3.31^{ijklmnop}$
104	IC73068	1.53^{bc}	4.47^{abc}	5.00^{a}	3.67^{ab}
105	IC20607	1.20^{fg}	3.60^{klmno}	4.60^{bcdefg}	3.13^{pq}
106	IC259084	1.20^{fg}	4.20^{bcdefg}	4.33^{fghi}	3.24^{lmnopq}
107	IC582853	1.40^{de}	3.93^{fghijk}	5.00^{a}	$3.44^{efghijk}$
108	EC367683	1.33^{de}	3.73^{ijklmn}	4.60^{bcdefg}	3.22^{lmnopq}
109	EC738118	1.60^{b}	3.53^{lmno}	4.20^{hi}	3.11^{q}
110	Check C-152	1.60^{b}	4.47^{abc}	4.93^{ab}	3.67^{ab}
SE.m ±		0.04	0.10	0.09	0.05
CD (p = 0.05)		0.11	0.29	0.27	0.14
CV (%)		4.96	4.94	3.71	2.73

Table 2: Aphid damage score of different cowpea genotypes

DAI – Day After Infestation

Meanvaluesineachcolumnfollowedby thesameletter donot differsignificantlybyDMRT(p=0.05)

IC206240 genotypes which were on par with the genotypes *viz.*, EC96654 (1.07), EC244065 (1.07), IC401381 (1.07), IC415416 (1.07) IC426812 (1.07), and IC201097 (1.07). The Damage score was a highest in IC622602 (1.80), which showed highly significant difference compared to other genotypes. It was followed by EC243999 (1.60), IC488271 (1.60), EC738083 (1.60), IC738093 (1.60), EC738277 (1.60), EC107163 (1.60), EC724261 (1.60) and EC738118 (1.60). Genotypes *viz.*, EC240930, EC244057, IC606653, IC338514, IC546503, IC137285, IC202856, EC240702, EC724160, IC73068, and recorded with damage score of 1.53. Genotypes *viz.*, EC244077, IC601541, IC331708, IC427586, GP70(C-845), EC109493/2744-1, IC202938, IC209139, and EC738088 recorded with damage score of 1.47. The Damage score of 1.20 was recorded in genotypes *viz.*, EC5269, EC43203,

EC98661, EC240979, EC240983, EC244047, EC244074, IC626167, NIC15346, IC334368, IC548860, IC385869, IC397618, IC399000, IC436623, EC517137, GP126/03(C-939), GP315/03(C-1254), IC53351, IC63390, IC202837, IC398031, EC107191, EC738092, EC367698, EC738154, SG/KT/48, IC20607, and IC259084. Genotypes EC219922, EC240829, EC240862, EC243943, EC244134,IC342702, IC610281,IC472264,IC353873, IC488259,IC546519, IC91476, IC257430, IC259075, IC326997, IC369857, IC471384, EC724717, EC738089, EC724874, EC738260, and IC582853 were recorded with a rating of 1.40. Genotypes IC257211, IC311918, IC546523, IC209144, EC738091, EC738128, and EC367683 genotypes were registered 1.33 damage rating followed by genotypes EC243939, and C372722 with 1.27 damage score. Susceptible check C 152 recorded with 1.60 damage score.

Damage score ratings at 14 days after infestation showed, significantly different among the genotypes. During this point of time, the damage score of the genotypes ranged between 1.87 to 4.67. Damage due to aphids steadily increased from 7 to 14 days after infestation. Damage score was significantly lower in genotypes *viz.*, IC372724 (1.87), IC399000 (1.94), IC415590 (2.00), IC401381 (2.13), and IC426812 (2.13), and was on par with each other. Maximum damage score (4.67) was observed in IC342702 and IC326997 Further, they were on par with the genotypes *viz.*, EC244077 (4.53),IC202837 (4.47), IC738093 (4.47), EC724874 (4.47), IC73068 (4.47), IC606653 (4.40), IC257430 (4.40),EC107191 (4.40), EC240930 (4.33) EC38214 (4.33), and EC367698 (4.33). Susceptible check C 152 recorded with a 4.47 damage score.

At 21 days after infestation damage score among the genotypes ranged from 2.47 to 5.00. Most of the genotypes *viz.*, EC240829, EC240862, EC240930, EC240979, EC244057, EC244074, EC244077, IC342702, IC606653, IC610281, IC311918, IC331708, IC334368, IC372722, IC519708, GP70(C-845), GP315/03(C-1254), IC91476, IC201097, IC202856, IC257430, IC259075, IC326997, IC369857, EC724717, IC202837, EC240702, EC738089, EC738091, EC738092, IC738093, EC738277, EC107163, EC367698, EC724874, EC738088, SG/KT/48, IC73068, and IC582853 recorded with 5.0 damage score. They were statistically on par with EC244047 (4.93), IC548860 (4.93), IC353873 (4.93), IC137285 (4.93), and EC107191 (4.93) followed by IC53351 (4.87), EC738128 (4.87), EC5269 (4.80), EC219922 (4.80), EC240983 (4.80), EC243939 (4.80), IC257211 (4.80), NR-18-75 (4.80), EC38214 (4.80), IC39930 (4.80), EC738260 (4.80), EC243999 (4.73), EC244065 (4.73), NIC15346 (4.73), IC546523 (4.73), EC109493/2744-1 (4.73), IC206240 (4.73), EC43203(4.67), EC93086(4.67), EC98661 (4.67), EC243943 (4.67), EC244134 (4.67), IC331106 (4.67), IC397618 (4.67), IC415416 (4.67), IC202780 (4.67), IC202938 (4.67), IC209139 (4.67), and IC398031 (4.67). The least damage score was observed in genotype IC420467 (2.47) followed by IC372724 (2.67), IC400103 (2.67), IC401381(2.73), IC399000 (2.87), IC415590 (2.90), IC372726 (2.93), IC426812 (2.93), and NBGP8/03(C-715) (2.96).Susceptible check C 152 recorded with 4.93 damage score.

Score	Reaction	Cowpea genotypes
1	Resistant	NIL
2	Moderately resistant	IC372724, IC401381, IC372726, IC399000, IC400103, IC415590, IC420467, IC426812, NBGP8/03(C-715)
3	ModeratelySusceptible	NIL
4	Susceptible	EC5269, EC43203, EC93086, EC96654, EC98661, EC101981, EC219922, EC240983, EC243939, EC243943, EC243999, EC244047, EC244065, EC244134, IC601541, IC626167, NIC15346, IC257211, IC472264, IC331106, IC548860, IC353873, IC385869, IC397618, IC415416, IC338514, IC427586, IC436623, IC488259, EC517137, IC546503, IC546519, IC546523, GP126/03(C-939), NR-18-75, EC38214, EC109493/2744-1, IC39930, IC53351, IC63390, IC137285, IC202780, IC202938, IC206240, IC209139, IC209144, IC471384, IC488271, IC398031, EC107191, EC738083, EC724160, EC724261, EC738128, EC738154, EC738260, IC622602, IC20607, IC259084, EC367683, EC738118, C 152
5	Highly susceptible	EC240829, EC240862, EC240930, EC240979, EC244057, EC244074, EC244077, IC342702, IC606653, IC610281, IC311918, IC331708, IC334368, IC372722, IC519708, GP70(C-845), GP315/03(C-1254), IC91476, IC201097, IC202856, IC257430, IC259075, IC326997, IC369857, EC724717, IC202837, EC240702, EC738089, EC738091, EC738092, IC738093, EC738277, EC107163, EC367698, EC724874, EC738088, IC73068, SG/KT/48, IC582853

Table 3: Classification of cowpea genotypes against cowpea aphid based on aphid damagescale (Omoigui*et al.*, 2017)

In the present study, among the 109 cowpea genotypes screened for resistance to cowpea aphids, nine genotypes namely IC372724, IC401381, IC372726, IC399000, IC400103, IC415590, IC420467, IC426812, and NBGP8/03 (C-715) consistently expressed high resistance to cowpea aphid by recording less damage score ranging from 2.67 to 2.96. Conversely, the cowpea aphid had its most profound impact on 38 cowpea genotypes, leading to a substantial mean damage score of 5.0. In this group, the majority of plants succumbed to the infestation before reaching the 21 days after infestation. Thus, these particular genotypes were classified as highly susceptible to cowpea aphids. Interestingly, susceptible check C 152 was not observed as highly susceptible. These findings were in agreement with the observations of Omoigui*et al*. (2017).

The current study was in agreement with the work of Kusi *et al*. (2020), which focused on ascertaining the consistency of aphid-resistant genotypes. In their study, they evaluated 10 specific genotypes across 18 distinct locations within Ghana. The outcomes revealed the stability of SARC1-57-2 across various ecologies, as it consistently exhibited resistance to aphids. Notably, this genotype displayed an increased vigor score of 3.8 ± 0.03 and a notably low plant mortality rate of 3.7 ± 0.22%, distinguishing it from the susceptible genotypes in terms of resilience and survival.

In the similar line of work, Togola *et al*. (2020) assessed a total of 375 cowpea lines against cowpea aphid, all of which were artificially infested in screening cages. The researchers found that after 21 days, TVu-6464, TVu-1583, TVu-15445, and TVu-801 recorded the lowest damage scores and were classified as resistant, 18 genotypes showed moderate seedling damage scores and classified as moderately resistant and the remaining mini-core genotypes, including TVu-1727, and TVx-3236 were susceptible to *A. craccivora*.

4.CONCLUSION

Greenhouse studies were conducted on 109 cowpea genotypes to assess the resistance to cowpea aphid. The results showed that out of 109 only, nine genotypes (IC372724, IC401381, IC372726, IC399000, IC400103, IC415590, IC420467, IC426812, and NBGP8/03(C-715) showed moderately resistant to cowpea aphid remaining genotypes categorized as susceptible (61 genotypes) and highly susceptible (39genotypes) and check C 152 was also showed susceptible nature to cowpea aphid. The mini core genotypes identified with good resistance are potential sources of aphid resistance genes and can be used in the cowpea breeding program to improve the crop's performance in *A. craccivora* prone farmers' fields.

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Option 1:

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc) and text-to-image generators have been used during writing or editing of manuscripts.

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Details of the AI usage are given below:

1.

2.

3.

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