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Sourcing for COWPEA APHID (*Aphis craccivora*) Resistance Gene among COWPEA WILD RELATIVES

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ABSTRACT: Cowpea aphid (*Aphis craccivora* Koch.) is an important insect pest of cowpea worldwide, especially in the tropical sub-Sahara region. Cowpea yield loses due to infestation by this pest could be up to 80% in severe cases. Host plant resistance to this insect pest is a more effective, economically viable and eco-friendly option in mitigating damage by cowpea aphids. Based on this, experiments were carried out to find new sources for cowpea aphid resistance gene in cowpea wild relatives. One hundred and ten cowpea wild relatives accessions obtained from the genebank at National Centre for Genetic Resources and Biotechnology, Ibadan, Nigeria, alongside ten landraces and cultivated varieties were used in this study. Five adult aphids were placed on each seedling seven days after sowing. These were maintained in a mesh house for 21 days, at NACGRAB, North Central Zone, Badeggi, Nigeria. At the expiration of 21 days, accessions with completely dead plants were regarded as susceptible while those with living plants were classified as resistant/tolerant. In the second experiment, seeds of surviving plants and controls were planted in wooded trays placed in smaller insect proof cages within the mesh house. These were infested with aphids. Results showed that 21 DAI, the cowpea wild relatives, NGB001178 and NGB001055 supported less number of aphids (13.33 and 17.77), had least aphid damage scores (1.33 and 1.33) and highest seedling survival percentages (100% and 94%) respectively. These accessions are recommended to be used in cowpea breeding programmes for aphid resistance.

KEYWORDS: Cowpea, Wild relatives, Aphids, Resistance,

I. INTRODUCTION

Cowpea is a major staple food crop for people in rural and urban areas relied on by over 200 million people in Africa (1. Degri *et al*., 2012; 2FAO, 2014). The crop is highly adapted to poor soils and drought conditions making a very important food source in this age of climate unpredictability. It is rich in protein, with a protein content of 23.4% when dry and 3.4% when green or fresh (3Nimoh and Asuming-Brempong, 2012). Providing much needed protein for the poorest of especially sub-Saharan Africa, cowpea is often referred to as the poor man's meat (4Laphale *et al*., 2012). Insects attack is probably the biggest challenge to both small and large scale cowpea growers. This is because cowpea is prone to infestation and damage by various insect pests. Of these cowpea aphid (*Aphis craccivora* Koch.) is considered to be the most important pest of cowpea (Anan *et al*., 2000). Adult and nymphs of aphids feed on cowpea plants by sucking fluid from the stem terminal shoots, petioles, flowers and pods (5Ofuya, 1997; 6Asiwe *et al*., 2005). *A. craccivora* also transmits cowpea aphid – borne mosaic virus resulting in yield loss (7Jackai *et al.*, 200; 8Lamari *et al*., 2008). Several cowpea varieties cultivated by farmers in Nigeria are susceptible to cowpea aphids and require several sprays of pesticides from early vegetation stages through flowering to pod formation stages. Several sprays of pesticides to control aphid increases cost of production and cowpea production in Nigeria. Adoption of chemical control has its attendant problems of availability, cost of inputs and the required changes in cropping strategy. Furthermore, the health risks of environmental pollution, pest resurgence, pest resistance to insecticides and lethal effects on non-target organisms caused by the excessive use of pesticides cannot be overemphasized.

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There are reports that some cowpea varieties with resistance to cowpea aphids are losing their resistance (9 Ekeuro, *et al*, 2017). 10Aliyu and Ishiyaku (2013) reported that IT84S-2246 hitherto known to be resistant to aphids and lines derived from it showed susceptibility reactions to aphids at IAR, Zaria. This may be as a result of production of new aphid biotype adapted to overcoming the host plant resistance mechanism. Moreover, screening of wild relatives of cowpea for aphid resistance gene is a new area of interest yet to be fully explored. Therefore, search for new sources for aphid resistance gene from cowpea wild relatives have never been more necessary. This study is aimed at screening several cowpea wild relatives for presence of aphid resistance traits.

II. MATERIALS AND METHODS

The experiments were carried out at National Centre for Genetic Resources and Biotechnology (NACGRAB), north central zone research field and mesh house at Badeggi, Niger State. The site is located 95m above sea level at 9°04'02" N and 6°05'31" E.

One hundred and twenty cowpea wild relatives collected from different areas in Nigeria and kept in the National gene bank at NACGRAB, Ibadan were screened in a mesh house for aphid resistance/tolerance. The screening involved two phases. An initial screening of

Of these, ten were promising. Additional screening in the mesh house and under natural field conditions is been done to ascertain the level of resistance/tolerance of these genotypes to cowpea aphids.

III. RESULTS

A. Percentage surviving plants of 100 accessions after 21Days of cowpea aphid infestation

There were significant ($P < 0.05$) differences among the 120 accessions studied for number of surviving plants at 13, 17 and 21 days after infestation (DAI) (Table 1). Percentage surviving plants infested with cowpea aphids in Table 4.1 shows that the plants of 16% to 34% of the accessions began to die at 13 days after infestation. The plants were first characterized by yellowing of leaves, stunted growth and general weakness of the stem. At 17 days after infestation more of susceptible plants die leaving only 14-46% of plants several of which have become severely weakened. IT97K-556-4 (74%), IT90K-76 (86%), TVU3346 (86%), TVNu-2141 (100%), NGB001055 (86%), NGB001014 (54), NGB001035 (50%), NGB001067 (86%), NGB001080 (60%), NGB001086 (54%), NGB001995 (60%), NGB001118 (60%), NGB001128 (60%), NGB001176 (54%), NGB001105 (60%) where the accessions with at least 50% surviving seedlings at the close of the experiment 21 days after infestation with aphids. TVNu-2141 and NGB001055 were the only accessions with 100 percent surviving seedlings at 21days after infestation (Table 1)

Twelve wild cowpea relatives having high percentage (by interpretation most number) of surviving plants were selected. Cultivated varieties with resistance to cowpea aphids and farmers preferred varieties that are susceptible were used in the second mesh house experiment for aphid resistance. These were also evaluated for aphid resistance under natural field infestations in 2016 and 2017 rainfed seasons. Yellowing of seedling leaves were observed 21 days after infestation with cowpea aphids.

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Table 1: Percentage survival of cowpea seedlings 5, 9, 13, 17 and 21 after infestation (DAI) with cowpea aphids in 2016 Mesh house experiment.

S. No	Accession	No of surviving plants				
		5DAI	9DAI	13DAI	17DAI	21DAI
1	IAR-48	100	100	80	14	6
2	IT97K-499-10	100	100	66	26	0
3	Early white	100	100	74	26	6
4	NGB001178	100	100	100	100	100
5	Sokoto beans	100	100	74	14	0
6	Bob Marley	100	100	74	26	0
7	IT97K-556-4	100	100	100	80	74
8	IT90K-76	100	100	80	94	86
9	TVU 3346	100	100	100	86	86
10	TVU 2845	100	100	80	46	20
11	NGB 000942	100	100	66	14	0
12	NGB 000998	100	100	86	34	0
13	NGB 001055	100	100	100	100	86
14	NGB 001013	100	100	80	34	0
15	NGB 001014	100	100	86	66	54
16	NGB 001016	100	100	80	34	6
17	NGB 001020	100	100	66	20	0
18	NGB 001021	100	100	74	26	6
19	NGB 001023	100	100	86	20	0
20	NGB 001024	100	100	86	34	0
21	NGB 001028	100	100	80	20	0
22	NGB 001035	100	100	100	54	26
23	NGB 001059	100	100	86	20	0
24	NGB 001060	100	100	80	40	0
25	NGB 001061	100	100	74	26	6
26	NGB 001066	100	100	54	0	0
27	NGB 001067	100	100	94	86	86
28	NGB 001068	100	100	74	6	0
29	NGB 001069	100	100	86	34	0
30	NGB 001070	100	100	94	40	34
31	NGB 001071	100	100	80	20	0
32	NGB 001074	100	100	86	26	0
33	NGB 001078	100	100	100	46	26
34	NGB 001080	100	100	94	60	60
35	NGB 001085	100	100	74	46	26
36	NGB 001086	100	100	94	60	54
37	NGB 001090	100	100	86	54	40
38	NGB 001091	100	100	94	26	0
39	NGB 001093	100	100	86	46	26
40	NGB 001094	100	100	86	46	0

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Table 1 Continued

41	NGB 001095	100	100	100	40	26
42	NGB 001096	100	100	86	54	34
43	NGB 001099	100	100	94	60	60
44	NGB 001100	100	100	100	54	34
45	NGB 001102	100	100	80	26	0
46	NGB 001179	100	100	60	14	0
47	NGB 001106	100	100	80	54	20
48	NGB 001107	100	100	86	40	34
49	NGB 001052	100	100	80	40	0
50	NGB 001114	100	100	100	46	34
51	NGB 001115	100	100	66	0	0
52	NGB 001116	100	100	86	26	6
53	NGB 001117	100	100	80	6	0
54	NGB 001118	100	100	86	60	60
55	NGB 001122	100	100	86	40	14
56	NGB 001123	100	100	74	34	26
57	NGB 001126	100	100	80	34	0
58	NGB 001127	100	100	74	0	0
59	NGB 001128	100	100	86	60	60
60	NGB 001130	100	100	66	20	6
61	NGB 001134	100	100	74	20	20
62	NGB 001135	100	100	60	26	0
63	NGB 001136	100	100	86	46	26
64	NGB 001138	100	100	66	0	0
65	NGB 001142	100	100	66	14	0
66	NGB 001143	100	100	80	40	34
67	NGB 001056	100	100	86	20	0
68	NGB 001147	100	100	80	14	0
69	NGB 001148	100	100	74	20	6
70	NGB 001151	100	100	74	14	0
71	NGB 001152	100	100	86	14	0
72	NGB 001153	100	100	86	40	26
73	NGB 001156	100	100	86	46	34
74	NGB 001157	100	100	80	20	0
75	NGB 001164	100	100	86	34	26
76	NGB 001159	100	100	74	20	0
77	NGB 001160	100	100	74	26	0
78	NGB 001162	100	100	74	34	0
79	NGB 001163	100	100	100	46	20
80	NGB 001163	100	100	86	46	34

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Table 1 Continued						
81	NGB 001166	100	100	100	26	6
82	NGB 001157	100	100	100	54	6
83	NGB 001168	100	100	100	54	14
84	NGB 001170	100	100	74	20	0
85	NGB 001171	100	100	86	46	14
86	NGB 001172	100	100	66	0	0
87	NGB 001173	100	100	80	20	6
88	NGB 001174	100	100	86	54	54
89	NGB 001175	100	100	86	20	0
90	NGB 001176	100	100	86	54	54
91	NGB 001092	100	100	86	40	34
92	NGB 001098	100	100	80	20	0
93	NGB 001101	100	100	74	0	0
94	NGB 001104	100	100	74	54	6
95	NGB 001105	100	100	100	60	60
96	NGB 001108	100	100	86	40	26
97	NGB 001120	100	100	86	54	34
98	NGB 001121	100	100	86	54	34
99	NGB 001124	100	100	74	14	0
100	NGB 001125	100	100	80	34	14
101	NGB 00169	100	100	80	14	6
102	NGB 000992	100	100	66	26	0
103	NGB 000994	100	100	74	26	6
104	NGB 001000	100	100	66	26	0
105	NGB 001006	100	100	74	14	0
106	NGB 001027	100	100	74	26	0
107	NGB 001032	100	100	86	34	26
108	NGB 001033	100	100	74	20	0
109	NGB 001034	100	100	86	46	34
110	NGB 001055	100	100	80	20	0
111	NGB 001130	100	100	74	34	0
112	NGB 001137	100	100	66	26	0
113	NGB 001140	100	100	74	14	0
114	NGB 001141	100	100	74	26	0
115	NGB 001146	100	100	86	34	26
116	NGB 001156	100	100	86	46	34
117	NGB 001158	100	100	80	20	0
118	NGB 001177	100	100	74	20	0
119	NGB 001061	100	100	86	46	34
120	NGB 001145	100	100	66	26	0

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B. Number of aphids per plant

Results of cowpea response to aphids evidenced by number of aphids per plant five to 21 days after infestation is showed significant differences in cowpea aphid number per plant at 5, 9, 13 and 17 days after infestation (Table 2). The number of aphids per plant had generally lower mean for wild relatives at 5DAI (26.51), 9DAI (60.87), 13DAI (66.01), 17DAI (35.65) and 21DAI (85.09) compared to the cultivated varieties means at 5DAI (45.61), 9DAI (99.52), 13DAI (124.54), 17DAI (226.77) and 21DAI (105.77) (Table 2). NGB001178 and NGB001055 supported the least number of aphids per plant at 5DAI (6.75, 7.75), 9DAI (13.93, 26.15), 13DAI (11.20, 36.10), 17DAI (16.92. 20.56) and 21DAI (13.33. 17.43) respectively among the wild *Vigna* accessions and the cultivated varieties. Highest number of aphids per plant was recorded in NGB00118 and NGB001099. These respectively had at 101.37, 119.0 at 9DAI and 96.33, 100.1 at 13DAI. The variety IT90K-76 (27.33. 30.33, 35.40, 27.44 and 26.90) and landrace TVU3346 (37.53, 28.50, 37.90, 27.87 and 24.87) supported the least numbers of aphids per plants at 5, 9, 13, 17 and 21DAI respectively among the cultivated varieties (Table 2).

Dark masses were observed at the edge point where the first folial leaves form due to multiplying aphid population and secretion of dark soot like product of their activities. Infestation progress with increased number of days and susceptible genotypes showed yellowing leaves, weak hypocotyls. Susceptible genotypes start dying off while resistant genotype like NGS001055 and NGS100 1178 still had all its plants alive (Table 2).

Table 2: Number of aphids per cowpea seedling from 5 to 21 days after infestation with cowpea aphids

-	Code	Accessions	Number of aphids per plant				
			5DAI	9DAI	13DAI	17DAI	21DAI
	Wild *Vigna*						
1	4	NGB001178	6.75c	13.93e	11.20d	16.92h	13.33
2	13	NGB 001055	7.75c	26.15de	36.10cd	20.56g	17.43
3	15	NGB 001014	9.00c	35.67c-e	81.90b-d	60.48c	54.33
4	22	NGB 001035	20.87bc	84.33a-e	72.50b-d	60.00c	-
5	27	NGB 001067	23.67bc	28.50c-e	68.53b-d	55.68d	47.43
6	34	NGB 001080	79.10a	43.97b-e	65.53b-d	-	-
7	36	NGB 001086	45.47a-c	58.27b-e	54.43b-d	-	-
8	43	NGB 001099	19.20bc	119.00a-c	96.33b-d	-	-
9	54	NGB 001118	21.12bc	101.37a-e	100.10b-d	-	-
10	59	NGB 001128	20.17bc	81.33a-e	61.73b-d	-	-
11	66	NGB 001143	40.52abc	45.83b-e	54.03b-d	-	-
12	95	NGB 001105	24.50bc	92.13a-e	89.70b-d	-	-
	Mean		**26.51**	**60.87**	**66.01**	**35.65f**	**85.09**
	Cultivated cowpea						
13	1	IAR-48	47.53a-c	115.67a-d	176.93ab	-	-
14	2	IT97K-499-10	28.48bc	111.43a-d	167.57abc	-	-
15	3	Early white	57.80ab	115.80a-d	100.57bcd	-	-
16	6	Bob Marley	79.10a	159.20a	266.77a	-	-
17	7	IT97K-556-4	45.47abc	103.87a-e	84.60bcd	71.03b	54.00
18	8	IT90K-76	27.33bc	30.33c-e	36.40cd	27.44e	26.90
19	9	TVU 3346	37.53bc	28.50c-e	37.90cd	27.87e	24.87
20	10	TVU 2845	41.62a-c	131.35ab	125.57b-d	100.43a	80.00
	Mean		**45.61**	**99.52**	**124.54**	**226.77**	**105.77**

Means followed by similar letters in same column are not significantly different ($P \leq 0.05$) probability level, DMRT

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C.Percentage seedling survival of cowpea seedlings at 5, 9, 13, 17, and 21 days infested with cowpea aphids

Results showing response of cowpea accessions to aphid infestation as revealed by percentage seedling survival is shown in Table 3. Effect of the aphid infestation starts becoming obvious at 13 days after infestation. This is when seedlings start of non-resistant cowpea plants start to show yellowing of leaves weakness of hypocotyl and death (Table 3).

Cowpea wild relatives NGB001143 (80%) NGB001014 (86%) NGB001118 (86%) and NGB001128 (86%) had the lowest percentage of surviving seedlings at 13DAI with cowpea aphids while NGB001178, NGB001055, NGB001035 and NGB001105 all had perfect 100 percent survival at 13DAI. These were higher than those among the cultivated varieties (Table 3). The cultivated varieties 1T97K-499-10, Early white and Bob Marley at 13DAI with aphids had 66%, 74% and 74% of seedling surviving respectively. Seedlings survival percentages recorded for 54% for NGB001035 and NGB001143 were the lowest among the wild relatives while 26% a piece recorded for 1T97K-499-10, Early white and Bob Marley was the lowest among the cultivated varieties at 17 days after infestation with cowpea aphids (Table 3).Twenty one days after infestation only three wild accessions and three cultivated varieties still had plants infested with aphids. All other nine wild accessions and five cultivated varieties have all their plants dead due to aphid feeding activities. By implication, these accessions have survived aphid attack by varying degrees**.**

Table 3: Percentage survival of cultivated cowpea seedlings from 5 to 21 days after infestation with cowpea aphids

S. No	Code	Accessions	Percentages of surviving plants				
			5DAI	9DAI	13DAI	17DAI	21DAI
	Wild *Vigna*						
1	4	NGB001178	100	100	100	100	100
2	13	NGB 001055	100	100	100	94	94
3	15	NGB 001014	100	100	86	66	54
4	22	NGB 001035	100	100	100	34	0
5	27	NGB 001067	100	100	94	66	56
6	34	NGB 001080	100	100	94	40	0
7	36	NGB 001086	100	100	94	40	0
8	43	NGB 001099	100	100	94	40	0
9	54	NGB 001118	100	100	86	40	0
10	59	NGB 001128	100	100	86	40	0
11	66	NGB 001143	100	100	80	34	0
12	95	NGB 001105	100	100	100	40	0
	Mean (%)		**100**	**100**	**92.8**	**52.82**	**25.33**
	Cultivated cowpea						
13	1	IAR-48	100	100	80	0	0
14	2	IT97K-499-10	100	100	66	0	0
15	3	Early white	100	100	74	0	0
16	6	Bob Marley	100	100	74	0	0
17	7	IT97K-556-4	100	100	100	80	74
18	8	IT90K-76	100	100	80	94	86
19	9	TVU 3346	100	100	100	86	86
20	10	TVU 2845	100	100	80	46	20
	Mean (%)		**100**	**100**	**81.8**	**38.25**	**33.25**

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D. Aphid population build-up

Aphid population build-up at 5, 9, 13, 17 and 21 days after infestation shown in Table 4 reveal significant difference ($P < 0.05$) among the genotypes studied. The values ranged from 1.0 (NGB001178, NGB001055 and NGB001014) to 3.33 (Bob Marley) at 5 days after infestation; 1.0 (NGB001178) to 4.33 (NGB001099, NGB001118, IAR-48, Bob Marley and TVU 2845) at 9 DAI.NGB001178 had the least aphid population build-up of 1.0, 1.33, 1.0, 1.33 at 9, 13, 17 and 21 DAI respectively. This was followed by NGB001055 with 2.0., 2.0,. 1.67 and 1.33 at 9, 13, 17 and 21 DAI respectively. The genotypes with the highest aphid pressure respectively at 9 and 13 DAI are IAR-48 and Bob Marley (4.33 and 4.67) (Table 4). NGB001080, NGB001086, NGB001099, NGB001118, NGB001128, NGB001143, NGB001105 wild relatives had no seedlings alive at 17 and 21 DAI and NGB001035 also had no more seedlings at 21 DAI. Similarly, the cultivated genotypes IAR-48, IT97K-499, Early white and Bob Marley had no seedlings alive at 17 and 21 DAI. Among the genotypes having seedlings at 17 and 21 DAI, TVU2845 (3.67) had the highest aphid population pressure at 17DAI while NGB001014 had the highest at 21 DAI.

Generally, the mean aphid population build-up was lower in the cowpea wild relatives at 5, 9, 13, 17 and 21 DAI (2.03, 2.94, 3.36, 2.53 and 2.25) respectively compared to values (2.50, 3.35. 3.58, 2.75 and 2.58) respectively recorded for the cultivated genotypes (Table 4)

Table 4: Aphid population build-up (pressure) at 5, 9, 13, 17 and 21 days DAI with cowpea aphids in 2016 mesh house experiment.

S. No	Code	Accessions	Aphid population build-up				
			5DAI	9DAI	13DAI	17DAI	21DAI
	Wild *Vigna*						
1	4	NGB001178	1.00c	1.0e	1.33f	1.0c	1.33e
2	13	NGB 001055	1.00c	2.0de	2.00ef	1.67b	1.33e
3	15	NGB 001014	1.00c	2.33c-e	3.0b-e	3.33a	3.67a
4	22	NGB 001035	2.00abc	3.33a-d	4.0a-c	3.33a	-
5	27	NGB 001067	2.33abc	2.33c-e	3.67a-d	3.33a	2.67c
6	34	NGB 001080	3.33a	2.67b-d	3.67a-d	-	-
7	36	NGB 001086	2.67ab	3.33a-d	3.33a-d	-	-
8	43	NGB 001099	1.67bc	4.33a	4.0a-c	-	-
9	54	NGB 001118	2.00abc	4.33a	4.0a-c	-	-
10	59	NGB 001128	2.33abc	3.33a-d	4.0a-c	-	-
11	66	NGB 001143	2.67ab	2.67b-d	3.67a-d	-	-
12	95	NGB 001105	2.33abc	3.67a-c	3.67a-d	-	-
	Mean		**2.03**	**2.94**	**3.36**	**2.53**	**2.25**
	Cultivated cowpea						
13	1	IAR-48	2.67ab	4.33a	4.67a	-	-
14	2	IT97K-499-10	1.67bc	4.00ab	4.33ab	-	-
15	3	Early white	3.00ab	4.00ab	4.00a-c	-	-
16	6	Bob Marley	3.33a	4.33a	4.67a	-	-
17	7	IT97K-556-4	2.33abc	2.33c-e	2.67c-e	3.00a	3.0bc
18	8	IT90K-76	2.00abc	2.00de	2.33d-f	2.00b	2.0d
19	9	TVU 3346	2.33abc	2.00de	2.00ef	2.33b	2.0d
20	10	TVU 2845	2.67ab	4.33a	4.00a-c	3.67a	3.33ab
	Mean		**2.50**	**3.50**	**3.58**	**2.75**	**2.58**

Means followed by similar letters in same column are not significantly different ($P \leq 0.05$) probability level, DMRT

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IV. DISCUSSION

The aphid susceptible plants were characterized by yellowing of leaves, stunted growth and general weakness of the stem. These symptoms result from the feeding of aphids leading to loss of essential food needed by the plants to support itself. Similar yellowing of leaves and stunted growth resulting from aphid infestation of cowpea plants have been reported by Potarot and Nualsri (2011); Omoigui *et al*. (2017).

The effect of aphid multiplication on both tolerant and susceptible accessions seemed to set in at 13 days after infestation. This means that rapid multiplication and the colonization of the plants by the aphids occurred between 7-9 days after infestation. This is in line with the findings of Souleymane *et al*. (2013) who reported rapid multiplication between 7 to 10 days after infestation. The accessions with completely dead plants (0% survival) were taken to be susceptible to cowpea aphids and those having 50% to 100% surviving plants classed to have resistance or tolerance to cowpea aphids. Souleymane *et al.* (2013) in their screening of 100 cowpea accessions also opined that dead plants were susceptible and those still alive and developing first trifoliate leaves were resistant. The high mortality rate recorded in most accessions' seedlings indicated by low survival percentage was due to excessive feeding on the seedlings leading to yellowing of leaf, stunted growth and eventual death is an evidence of high susceptibility of these accessions. Similar results have been reported by Ekuero *et al*. (2017).

The consistently lowest numbers of aphids per plant recorded in NG001178 and NG001055 is an indication of their resistance to cowpea aphids. This result agrees with the reports by Suleymane *et al*. (2013) and Ekeuro *et al*. (2017) of fewer numbers of aphids per plant in resistant varieties compared to susceptible varieties usually high aphid populations. Low number of aphids per plant in these varieties in combination with low aphid population pressure is an indication of their resistance to cowpea aphids. Babura and Mustapha (2012) in screening 52 cowpea varieties reported very few aphids on seedlings in resistant varieties. Similarly, the IT90K-76 and TVU 3346 varieties were resistant among the cultivated varieties with significantly lower aphid populations.

Aphid population pressure is an indication of the degree of aphid infestation on the cowpea plant. Aphid population pressure on the cowpea genotypes were varied depending on the genotype. Lesser aphid pressure on two cowpea wild relatives and two cultivated varieties makes them good sources of resistant genes for cowpea improvement programmes. Different accessions of cowpea responded in varying ways to the aphids attack. This indicates difference in the mechanism of resistance of the cowpea plants. Laamari *et al*. (2008) reported similar results and described three forms of resistance as tolerance, antibiosis, and antixenotic. Conclusively, the cowpea wild relatives NG001178 and NG001055 could be used as donor parents in the breeding for cowpea aphid resistance.

V. CONCLUSION

The results from this work have revealed two highly promising cowpea wild relatives accessions with genes for cowpea aphid resistance. These accessions can be integrated into cowpea breeding programmes for aphid resistance in Nigeria and beyond. However, further molecular evaluation will be done to .corroborate the results of the morphological screening.

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