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PERFORMANCE OF COWPEA LINES TO THRIPS ATTACK IN OGBOMOSO AGRICULTURAL ZONE OF NIGERIA

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ABSTRACT

Thirty four lines of cowpea were evaluated for their resistance to flower thrips. Selections were based on the ability of cowpea lines to produce peduncles and pods, the numbers of peduncles and pods produced per plants under thrips attack. Based on the performance of these lines during the first evaluation, fourteen lines were selected for the second rating. At the end of the second evaluation ten lines comprising four IITA lines and six landraces were identified to show good performance in resistance to thrips attack. These lines are: IT90K-277-2, TVu3629, TVu13685, TVu1509, BK-2K-05N, BK-2K-02RD, ID2K-05IM, BK-2K-011RP, ID2K-02M, ID2K-01M. These lines identified or selected for good performance can be used for further breeding work for cowpea improvement or recommended to farmers to reduce their cost on insecticides.

Keywords: Cowpea, flower, thrips, insecticides, resistance, performance, landraces, elite.

INTRODUCTION

The use of expensive synthetic insecticide such as methomyl, monocrotophos and cypermetrin has been the major control measure adopted for the control of flower thrips. This mean additional cost to the farmers and makes cowpea production an expensive and risky venture for the poor farmers of Africa.

The screening of cowpea lines is practicable only in the field, cowpea researchers in IITA have developed some screening techniques and have identified some cowpea germplasm that have moderate resistance to thrips. One of such is TVu 1509 but this cowpea line has poor agronomic characters. TVu 1509 has been crossed with Ife Brown which is of high yield to produce TVx 3236 which combines both moderate resistances to thrips with high yield. Hence (Abudulai *et al.*, 2006; Alabi *et al.*, 2003; Omo-Ikerodah *et al.*, 2009; Singh *et al.*, 1997).

Little success has been achieved in the control of pest without the use of insecticides. These insecticides are scarce and too expensive to be affordable by farmers, apart from its pollution effect on the environment. The

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major task before the geneticists and cowpea breeders is to search and identify specific genetic factors that will confer resistance to flower thrips on cowpea and assemble them in the elite cowpea lines to enhance their field performance and to improve the agronomic characters in the land races that show some resistance to insect pest but with one agronomic setback or the other. Many improved varieties of cowpea have been released to the farmers buy yet the local farmers still prefer growing their local varieties in intercrops with millet and/or sorghum with no insecticides spray. This is so because the so-called improved varieties do well only if they are protected with insecticides. The local farmers therefore resort to growing their seeds in their traditional method without control on the insect pest. These farmers also lack the usually complex and cumbersome technical know-how required to maintain these improved cowpea varieties. It will then be a profitable effort to embark on research efforts to improve the genetic quality of the landraces of cowpea through breeding for resistance to insect pest attack and improving on their agronomic characters.

A step towards this broad objective of cowpea research is the reasoning behind this research. Hence, the major

aim of this research is to collect, characterize and evaluate some landraces of cowpea grown by the local farmers in Ogbomosho Agricultural Zone along with some elite lines developed in IITA to access their level of performance and to identify lines with resistant genes to thrips attack. The identified lines can be used for further breeding work by transferring the useful genes in them to other elite cowpea lines. They can also be worked with to improve their agronomic characters. The outcome of this can also serve as basis for advising the local farmers in Ogbomosho Agricultural zone on the varieties of cowpea to be cultivated with little input yet give them reasonable and profitable yield.

MATERIALS AND METHODS

Collection and Acquisition of Cowpea Lines: A total of thirty-four cowpea lines were used in this study. Ten of these lines were supplied by the International Institute of Tropical Agriculture (IITA), Ibadan, while the remaining was obtained from traders and farmers in Ogbomosho Agricultural Zone.

Cultivation of the Cowpea Lines: The four seeds of each cowpea lines were planted in plastic pots filled with top soil and ten pots were planted for each cowpea line. The ten pots for each line were divided into two groups of five pots. The first group was protected against insect attack using insecticides while the second group was

without protection. The plants were later turned to two plants per pot when they were about three weeks old. The protected plants were sprayed with Karate at a concentration of 1ml of Karate in 200ml of water from the period of flower bud initiation to pod maturity. The protected group was to ensure seed production in case there is total damage in the group under no protection. The plants were raised in the open and watered regularly from seedling stage to maturity.

First Evaluation for Thrips Resistance: The thirty-four lines were evaluated for their ability to resist thrips attack using the following criteria: ability to produce peduncle, number of peduncles per plant, number of peduncles with or without pods, number of pods per peduncle, total pod production by plant and number of adult thrips counted in ten randomly picked flowers of each cowpea accession.

Second Evaluation for Thrips Resistance: The selected lines from the first evaluation were planted out for second rating of their ability to resist thrips using the criteria used in the first evaluation. This was done to confirm whether the selected lines will maintain their level of performance to thrips attack over time.

RESULT AND DISCUSSION

The results obtained from the first and the second evaluation are shown in Table 1.

Accessions	Source of Seeds	Seed Colour	Seed Texture	Seed Size
BK-2K-01IRP	Farmers, Surulere, Ogbomoso	Brown	Rough	Medium
Tvu 8461	GRU, IITA	Brown	Smooth	Medium
BK-2K-02RD	Farmer, Iresaapa, Ogbomoso	White	Rough	Medium
TVu 13685	GRU, IITA	Cream with Patches	Smooth	Small
BK-2K-031W	Farmer, Iware-Ile, Ogbomoso	White	Rough	Medium
TVu 14476	GRU, IITA	Tan	Smooth	Small
BK-2K-041W	Farmer, Iware-Ile, Ogbomoso	Speckled White	Rough	Medium
TVu 1509	GRU, IITA	Cream with Patches	Rough	Small
TVu 2027	GRU, IITA	White	Rough	Large
BK-2K-05N	Farmer, Oke-Aanu, Ogbomoso	White with Patches	Rough	Medium
OK-2K-05N	Farmer, Oke-Aanu, Ogbomoso	Cream with Patches	Rough	Small
OK-2K06KF	Farmer, Kinnira, Ogbomoso	Brown	Rough	Medium
OK-2K-03KF	Farmer, Kinnira, Ogbomoso	Tan	Smooth	Medium
OK-2K-04KF	Farmer, Kinnira, Ogbomoso	White	Rough	Medium
OK-2K-07KF	Farmer, Kinnira, Ogbomoso	Brown	Rough	Medium
TVu 11976	GRU, IITA	White	Rough	Medium
OK-2K-01KM	Farmer, Randa, Ogbomoso	White	Rough	Medium
OK-2K-02KM	Farmer, Ita-Alasa, Ogbomoso	White	Rough	Small
TVu 12349	GRU, IITA	White	Rough	Medium

ID-2K-01M	Farmer, Odo-Oba, Ogbomoso	White	Rough	Medium
TVu 3629	GRU, IITA	Brown	Rough	Medium
ID-2K-02M	Farmer, Odo-Oba, Ogbomoso	White	Rough	Medium
ID-2K-03M	Farmer, Odo-Oba, Ogbomoso	Brown	Rough	Medium
ID-2K-04FB	Farmer, Odo-Oba, Ogbomoso	White	Rough	Small
ID-2K-05FB	Farmer, Odo-Oba, Ogbomoso	Speckled White	Rough	Medium
ID-2K-06FB	Farmer, Odo-Oba, Ogbomoso	Brown	Rough	Large
ID-2K-07FB	Farmer, Odo-Oba, Ogbomoso	White	Rough	Medium
IT90-277-2	GRU, IITA	White	Rough	Medium
MU2K-01SF	Farmer, Idi-Araba, Ogbomoso	White	Rough	Medium
MU2K-05SM	Farmer, Idi-Araba, Ogbomoso	Brown	Rough	Medium

Table 2. First Evaluation of Cowpea Lines for Thrips Attack without Insecticides.

Accessions	DTF ^a	NTAFL ^b	TP ^c	PWP ^d	PWOP ^e	%PWP ^f	POPP ^g	TPP ^h	PST ⁱ	POPPL ^j	Remark
BK-2K-01IRP	49	8±3.33	81	73	8	90	1(1-3)	80	10	8.0	Selected
Tvu 8461	47	17.30±3.27	113	109	4	96	1(1-3)	78	10	7.8	Selected
BK-2K-02RD	72	1.50±3.12	20	19	1	95	2(1-2)	28	8	3.5	Selected
TVu 13685	58	4.10±1.66	99	92	7	93	2(0-3)	105	9	11.7	Selected
BK-2K-031W	72	3.80±1.57	25	21	4	84	2(1-2)	22	8	2.8	Rejected
TVu 14476	52	5.70±1.57	130	115	15	88	2(0-3)	249	10	24.9	Selected
BK-2K-041W	50	5.30±2.45	31	10	21	32	1(0-1)	20	7	2.9	Rejected
TVu 1509	47	4.60±1.96	48	45	3	94	1(0-1)	43	8	5.4	Selected
TVu 2027	86	7.20±2.12	22	8	14	36	1(0-2)	16	6	2.7	Rejected
BK-2K-05N	53	5.30±2.31	52	51	1	98	1(0-2)	69	10	6.9	Selected
OK-2K-05N	50	3.00±1.73	48	32	16	67	1(0-1)	37	10	3.7	Rejected
OK-2K06KF	52	3.00±2.35	44	16	28	36	1(0-1)	30	5	6.0	Rejected
TVu 2027	86	5.20±2.33	19	5	14	26	2(1-2)	12	6	2.0	Rejected
OK-2K-03KF	59	5.33±1.87	65	50	15	77	2(1-2)	31	10	3.1	Rejected
OK-2K-04KF	52	5.74±2.45	78	60	18	77	2(1-2)	27	10	2.7	Rejected
OK-2K-07KF	68	3.80±1.93	25	18	7	72	1(0-1)	22	5	4.4	Rejected
TVu 11976	58	2.20±1.10	37	27	10	73	1(0-1)	26	10	2.6	Rejected
OK-2K-01KM	58	4.00±0.63	42	31	11	74	1(0-1)	22	10	2.2	Rejected
OK-2K-02KM	46	2.30±1.52	58	42	16	72	1(0-1)	28	10	2.8	Rejected
TVu 12349	64	1.50±0.58	20	19	1	95	1(0-1)	38	8	4.8	Selected
ID-2K-01M	58	4.40±3.17	25	20	5	80	1(0-1)	51	6	8.5	Selected
TVu 3629	52	8.00±3.46	31	26	5	84	1(0-1)	100	10	10.0	Selected
ID-2K-02M	50	5.40±1.95	35	29	6	83	1(0-1)	36	10	3.6	Selected
ID-2K-03M	77	14.33±6.76	53	6	47	11	2(1-2)	20	10	2.0	Rejected
ID-2K-04FB	50	4.30±1.59	43	38	5	88	2(1-2)	51	8	6.4	Selected
ID-2K-05FB	60	7.30±3.53	56	48	8	86	2(1-2)	64	10	6.4	Selected
ID-2K-06FB	50	3.00±2.12	32	11	21	34	2(1-2)	16	10	1.6	Rejected
ID-2K-07FB	75	13.00±0.58	36	17	19	47	1(0-1)	16	8	2.0	Rejected
IT90-277-2	62	7.20±2.35	22	18	4	82	2(1-2)	46	8	5.8	Selected
MU2K-01SF	48	14.33±6.76	53	6	47	11	2(1-2)	46	8	5.8	Rejected
MU2K-05SM	49	4.20±1.64	62	40	22	65	2(1-2)	12	10	1.2	Rejected

The cowpea lines were selected or considered to show good performance based on their attributes such as peduncle production, pod production, proportion of

peduncle with pod, early flowering to escape thrips attack. Lines with 80% and above peduncles with pod were considered for good performance. The lines that

were observed to be susceptible to thrips attack due to their poor performance in respect of the criteria used for selection were rejected and were not planted for second evaluation. Out of the thirty-four lines evaluated, fourteen lines were selected and twenty lines rejected.

The fourteen cowpea lines identified to have shown good performance in the first evaluation for resistance to thrips attack were planted out for re-evaluation to verify whether they will maintain their level of performance using the criteria used during the first

evaluation. The results obtained during the second evaluation are presented in Table 2.

Ten lines were observed to maintain their level of performance in the second evaluation and are therefore considered to possess genetic factors for resistance to thrips attack. The lines BK-2K-011RP, BK-2K-02RD, TVu 13685, TVu 1509, BK-2K-05N, ID-2K-01M, TVu 3629, ID-2K-02M, ID-2K-05FB and IT90K-27A-2. These lines selected comprise of six landraces and four IITA lines. These lines can be arranged in their order of performances in Table 3.

Table 3. Second Evaluation of Cowpea Lines for Thrips Attack without Insecticides.

Accessions	DTF ^a	NTAFL ^b	TP ^c	PWP ^d	PWOP ^e	%PWP ^f	POPP ^g	TPP ^h	PST ⁱ	POPPL ^j	Remark
BK-2K-011RP	54	2.20±1.10	46	37	9	80	2(1-3)	35	10	3.5	Selected
Tvu 8461	61	3.30±1.52	81	27	54	33	2(1-3)	24	10	2.4	Rejected
BK-2K-02RD	42	1.00±2.12	61	50	11	82	2(1-2)	72	10	7.2	Selected
TVu 13685	46	1.10±0.58	34	29	5	85	2(1-3)	37	10	3.7	Selected
BK-2K-031W	42	1.50±3.12	54	34	20	63	2(1-2)	59	10	5.9	Rejected
TVu 14476	45	2.00±1.73	36	17	19	47	2(1-2)	16	10	1.6	Rejected
TVu 1509	44	2.00±0.55	31	29	2	94	1(0-1)	31	8	3.9	Selected
BK-2K-05N	58	1.50±0.22	30	25	5	83	2(1-2)	37	10	3.7	Selected
ID-2K-01M	53	2.20±1.00	58	47	11	81	2(1-2)	96	9	10.7	Selected
TVu 3629	50	2.00±0.10	32	28	4	88	2(1-2)	63	10	6.3	Selected
ID-2K-02M	48	1.00±0.80	55	46	9	84	2(1-2)	130	8	16.3	Selected
ID-2K-04FB	77	1.50±0.58	19	2	17	11	1(0-1)	22	10	2.2	Rejected
ID-2K-05FB	65	2.10±0.11	28	19	9	68	1(0-1)	157	10	15.7	Selected
IT90K-277-2	75	1.00±0.02	52	46	6	88	2(1-3)	75	10	7.5	Rejected

Table 4. Selected Cowpea lines based on their Performances.

Cowpea Lines	P ₂ WP (%)
TVu 1509	94
IT90K-277-2	88
TVu 3629	88
TVu 13685	85
ID-2K-02M	84
BK-2K-05N	83
ID-2K-05FB	82
BK-2K-02RD	82
ID-2K-01M	81
BK-2K-011RP	80

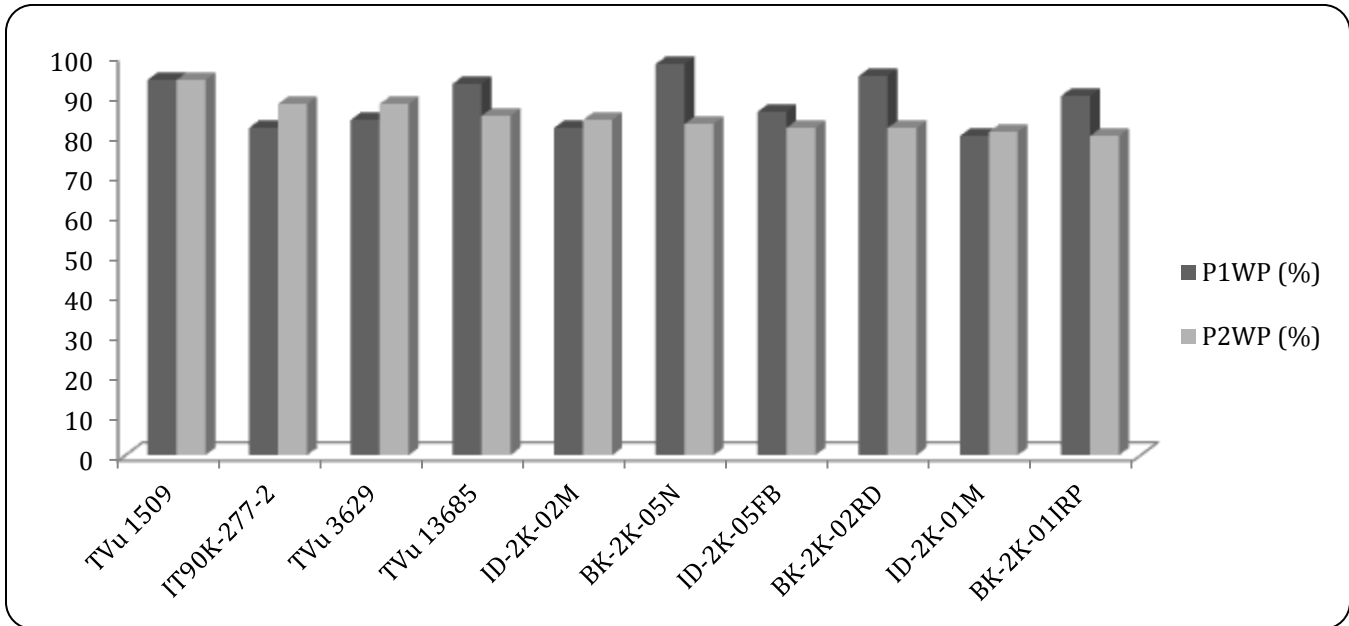
DISCUSSION

Four of the lines selected in the first evaluation did not maintain their performance to thrips attack during the second evaluation in spite of the very low population of insects during the second evaluation. This suggests instability in the performance of these cowpea lines to thrips attack. The thrips population during the first evaluation and hence thrips infestation cannot be said to

be high because of the low number of adult thrips counted per flower. This could be responsible for the good performance observed in TVu 8461 which is known and rated to be highly susceptible to thrips attack by IITA scientists. TVu 8461 was however observed to be highly prolific in flower production which could be an adaptive strategy to cover up for flowers destroyed by the flower thrips.

During the first evaluation, those cowpea lines that showed good performance by escaping thrips attack by flowering early did not maintain their performance during the second evaluation due to late flowering. Cowpea lines in this category include ID-2K-05FB and TVu 8461. Also, some lines that showed good performance to thrips attack in terms of high pod production in the first evaluation performed poorly in the second evaluation (Fig.1). The delayed flowering and poor podding observed during the second evaluation were due to the complications introduced by heavy viral attack on the plants. The viral attack was so severe that it suppressed the flowering and pod production capability of the plants.

Figure 1. Performances of the Selected Cowpea Lines in 1st and 2nd Rating.



Leaves of most of the plants were heavily attacked and deformed by the virus. This makes it difficult to draw conclusion on the maintenance of the performance level of the cowpea lines. In spite of this complication, some of the cowpea lines survived the problem and showed capacity for good performance. These are the ten lines that were eventually selected or identified for good performance to thrips attack.

The ten cowpea lines identified to show food performance to thrips attack can be considered to be good candidates for breeding works towards developing cowpea lines that will carry resistance to thrips attack. The performance exhibited by the IITA lines is a confirmation of the earlier evaluations carried out on them by the IITA scientists. Flower thrips are known to attack cowpea plants in large number. Under heavy attack, hundreds or thousands of adult insects can be counted in a flower. The thrips population was observed to be very low during this study as reflected in the number of adult insects counted in flowers (Adegbite personal communication). The cause of the low population of the flower thrips is not certain, but it may not be unconnected with the absence of other host plants around the experimental site from where the thrips can shift into the cowpea field. Another possible reason is the fact that cowpea has not been grown or cultivated in this area for a long period. It will therefore require regular planting of cowpea in different seasons in this area for the thrips population to build up to allow

proper and full observations on the population dynamics of flower thrips in this agricultural zone.

These factors coupled with the short duration of this study will make conclusions on the population dynamics of flower thrips in this area inadequate. A more reliable and informative conclusion should therefore await further evaluation studies that will span over a longer period in different locations within Ogbomoso agricultural zone, where and when conditions that will sustain large thrips population would have been put in place

CONCLUSION

The identification of lines with resistance factors among landraces is a new development that will go a long way in alleviating the plight of the local farmers. Further evaluation is needed to be carried out on the selected landraces over time and space. There is need for further breeding work in order to improve their agronomic characters such as seed size, days to 50% flowering, numbers of peduncle per plant, pod and seed production by transferring the useful genes in them to other elite.

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