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Effect of Sowing Dates on Yield and Yield Components of Cowpea Infected with Scab

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Abstract: The aim of the study was to investigate the effects of cowpea scab infections on yield and yield components of three cowpea varieties, TVx 3236, SAMPEA-6 and IT93K452-1. Fields experiments were carried out during three consecutive cropping seasons of 2004, 2005 and 2006 at the Institute for Agricultural Research Farms at Samaru and Shika, Nigeria. Four different plantings were made at 7-day interval starting from late July and ending in mid August of each year. Scab disease incidence ratings were taken at 42 and 49 days after sowing, during each season. Crop yields and yield components were estimated at the end of each season. The design used was a factorial concept in a randomized complete block design with three replications consisting of single row plots, each 75 cm wide, 6 m long, and 75 cm apart. For all the 3 seasons, the early sown cowpeas had higher- scab incidences and the yield and yield components of this early sown cowpea were lower than those from late sown crops. The grain yields from the early sown crops were of poor quality, with lots of shrivelling, while those from late sown crops were of good quality. The disease reduced grain yield through scab's deleterious effect on yield components. The correlation of scab infected plant parts with yield and yield components was positive and significant for SAMPEA-6 and IT93K452-1 but IT93k452-1 showed some variations in correlations. The correlation of scab on the yield and yield components of TVx 3236 was negative and not significant.

Key words: Correlation, cowpea, scab, *Vigna unguiculata,* yield, yield components

INTRODUCTION

Cowpea (*Vigna unguiculata* (L.) Walp (Fabaceae) is a very important food legume in the northern savanna states of Nigeria and other countries across the northern Guinea savannah region. In these regions rainfall is generally scanty and soils are sandy and relatively infertile for crop production. Cowpea is a cheaper source of protein than meat for the rural and urban poor in of countries in this region (Fawole *et al*., 2006). The crop is highly valued for both its grain for human consumption and forage for animal feed and therefore often has a dual utility (Henriet *et al*., 1997).

Scab, caused by the fungus *Sphaceloma* sp. is one of the most destructive diseases of cowpea in the Northern Guinea Savanna belt of West and Central Africa region where the crop is mostly grown (Emechebe and Shoyinka, 1985; Mungo *et al*., 1995). In Eastern and Southern Africa, the disease is prevalent from Ethiopia, Kenya, Uganda, Tanzania, Zambia (Iceduna, 1993; Edema *et al*., 1997; Tumwegamire *et al*., 1998) and Rwanda (Price and Cishahayo, 1985). Despite its wide geographical distribution, it appears to be ecologically restricted to semi-arid environments. In Nigeria, scab is seldom encountered outside a narrow latitudinal belt of about 10º30′-12º30′ N that corresponds approximately with the extent of the Guinea savannah. Scab is seed-borne and can be spread by rain splash, run-off and wind-blown moisture. It attacks all plant parts during all stages of growth (Emechebe, 1980; Singh and Rachie, 1985).

Yield losses of up to 100% due to severe infections have been reported from Nigeria (Emechebe and Shoyinka, 1985; Mungo *et al*., 1995), Zambia (Kannaiyan *et al*., 1987) and Uganda (Iceduna *et al*., 1994; Tumwegamire *et al*., 1998). The disease reduces grain yield through its deleterious effect on yield components such as the number of pods/plant, number of seeds /pod and 100- seed weight. It is unknown if these effects vary with the time of crop establishment. The main objective of this study was therefore to determine if there are any

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relationships between sowing dates and scab infection on the yield and yield components of cowpea.

MATERALS AND METHODS

Field experiments were carried out during the wet cowpea production seasons of 2003/2004, 2004/2005 and 2005/2006 at the Institute for Agricultural Research farms at Samaru and Shika (11º11′ N, 07º38′ E, 686m above the sea level) in Nigeria. These farms are located in the predominantly cowpea production district of northern Nigeria and supplies most of the cowpea grain to the rest of the country. For all three seasons of the study, three varieties of cowpea (TVx3236, SAMPEA-6, IT93K452-1) selected on the basis of their agronomic characteristics and reactions to scab were used. The variety TVx 3236 is moderately resistant, IT93K452-1 is moderately susceptible and SAMPEA-6 is susceptible to scab.

Four different sowing dates were investigated with 7 day interval starting from the last week of July in each year, when the typical first rains set in, and ending during the third week of August.

The experiment was arranged in a Randomized Complete Block Design (RCBD), in three replications. Each plot consisted of five 75 cm wide and 6m long separated by 75 cm ridges. The plots were separated by border rows consisting of one ridge along each of the plot length and 2 m along the width. Cowpea seeds were hand-sown at a depth of 3-5 cm and at the rate of two seeds per hole using a spacing of 25 cm between holes.

All plots were weeded with hand hoe, three times at 3, 6 and 9 weeks after germination in each season. Fertilizers (N.P.K., 15:15:15) were applied only once at 14 days after sowing (DAS). Plant stand establishment recordings were made 14 DAS and the plants were protected from insect damage by spraying biweekly with the insecticide uppercott (Cypermethrin+ Dimethoate) at 1 L/ha, starting at 21 DAS until 75% podding. No fungicide applications were made on the plots and the plots relied on natural rainfall for their irrigation and plant growth.

Data on scab disease incidence was recorded on the different plants from the three middle ridges in each plot at intervals of one week from the first appearance of scab infection symptoms on the plants.

At crop maturity, pods were harvested from all plants in the three middle ridges of each plot of the three varieties evaluated. The harvested pods were sun-dried for a 6 week period. Pod weight was taken for each plot. Combined seed yields from the harvested ridges of each plot were recorded after hand-threshing and winnowing by weighing on a balance.

The shelling percentage was determined from each plot. Three plants were selected at random from the three middle ridges to determine pod yield/plant and seed yield/plant. From the same plants, the number of pods/plant and seeds/pod were recorded. One hundred-seed weight was recorded from each plot. Data obtained was subjected to Analysis of Variance (ANOVA) using F-test and means separated using the Student Newman Keuls (SNK). The severity of scab recorded on the different plant parts and yield as well as yield components were also computed and correlations determined.

RESULTS

Disease incidence data recorded in the three-year study showed that at 42 to 49 DAS, scab incidence increased with plant age in all the three cowpea varieties, with SAMPEA-6 exhibiting the highest incidence followed by IT93K452-1 and then TVx 3236, which had the lowest scab incidence (Table 1).

In 2004, the effect of sowing dates on yield and yield components of the three varieties were not significantly different from each other. The differences observed on seed yield of TVx 3236 were statistically similar but the August-16 plantings had a higher seed yield when compared to the July-26 plantings. A general trend was observed for TVx 3236 and IT93K452-1 with early sown crops having a lower pod and seed yields than the late sown crops. A significant difference (P£0.05) was observed on the number of seeds/pod for IT93K452-1 with August-16 plantings having a higher number of seeds/pod as compared to the other sowing dates. The August-02 plantings were better for SAMPEA-6 for both yield and yield components. The shelling percentage was higher on TVx 3236 in the August-09 and on IT93K452-1 in the August-16 plantings when compared to the other sowing dates (Table 2).

In 2005, the differences on yield and yield components of the three varieties were not significantly different from each other but a significant ($p \leq 0.05$) difference was observed on pod yield of IT93K452-1 with the August-16 plantings having a higher pod yield when compared to the other sowing dates. The variety SAMPEA-6 had a higher number seeds/pod in the August-02 plantings as compared to TVx3236 and IT93K452-1. SAMPEA6 also had a higher pod yield, seed yield and number of pods/plant in for the August-09 plantings when compared to the other varieties. Shelling percentage was higher for TVx3236 and SAMPEA-6 in the August-16 plantings and for IT93K452-1. The July-26 plantings had the lowest shelling percentage when compared to the other sowing dates (Table 3).

In 2006, the varieties TVx3236 and IT93K452-1 showed the same trend for yield and yield components as in 2004 with the August-16 plantings proving better than the other sowing dates. SAMPEA-6 still proved better for both yield and yield components in the August-02 plantings but the number of pods/plant was higher in the

Table 1: Incidence of scab in three cowpea varieties at different sowing dates in 2004, 2005, and 2006 combined

		Scab Incidence in:					
		2004		2005		2006	
Variety	Sowing date	42DAS*	49 DAS	42 DAS	49 DAS	42 DAS	49 DAS
TVx3236	July – 26	1.20a	2.98a	0.56a	3.28a	0.00a	0.00a**
	August – 02	0.00a	2.43a	0.17a	2.99a	0.00a	0.00a
	August – 09	0.00a	2.29a	0.00a	0.98a	0.00a	0.00a
	August – 16	0.00a	2.12a	0.00a	0.00a	0.00a	0.00a
SAMPEA-6	July – 26	6.48a	10.53a	6.17a	18.03a	2.20a	5.25a
	August – 02	2.00a	11.05a	2.62a	14.79a	1.10a	4.30a
	August – 09	1.31a	7.27a	0.65a	5.71a	0.23a	1.35a
	August – 16	0.00a	4.69a	0.16a	5.23a	0.00a	0.47a
1T93K452-1							
	July – 26	1.08a	5.68a	4.81a	10.88a	1.05a	2.68a
	August – 02	1.62a	6.62a	2.01b	7.02a	0.25a	1.20a
	August – 09	0.00a	4.63a	0.76b	3.22a	0.00a	0.00a
	August – 16	0.00a	2.98a	0.58b	2.38a	0.00a	0.00a

*: DAS = days after sowing

**: Values in a column followed by the same letter are not significantly different at $p \leq 0.05$ (SNK Test)

Table 2: Effect of sowing date on yield and yield components on three cowpea varieties infected with scab in 2004

Variety	Sowing date	Pod yield	Seed yield	Shelling %	Pod wt/ plant	Seed wt / plant	Pods/plant	Seeds/pod	100-seed weight
TVx3236	July-26	533.30a	353.10a	58.46a	0.02a	0.02a	17.00a	9.00a	0.01a*
	August-02	972.90a	508.67ab	55.34a	0.03a	0.02a	18.00a	9.00a	0.01a
	August-09	864.20a	543.20ab	75.24a	0.03a	0.02a	19.30a	10.00a	0.01a
	August-16	1202.50a	703.67a	58.45a	0.02a	0.02a	21.00a	11.00a	0.01a
SAMPE-6	July-26	1538.30a	943.20a	60.19a	0.05a	0.03a	16.00a	10.00a	0.02a
	August-02	1802.80a	1091.40a	60.81a	0.07a	0.04a	20.00a	12.00a	0.02a
	August-09	1493.80a	851.90a	59.26a	0.05a	0.03a	16.00a	10.00a	0.02a
	August-16	1459.30a	851.80a	57.09a	0.04a	0.03a	12.00a	10.00a	0.02a
T93K452-1	July-26	753.10a	523.50a	57.20a	0.03a	0.02a	13.00b	9.00a	0.01a
	August-02	975.30a	543.20a	70.01a	0.03a	0.02a	13.00b	8.00a	0.01a
	August-09	1074.10a	637.30a	57.61a	0.03a	0.02a	16.00b	8.00a	0.01a
	August-16	1446.90a	1049.40a	72.19a	0.04a	0.03a	25.00a	9.00a	0.01a

*: Values in a column followed by the same letters are not significantly different at $p \leq 0.05$ (SNK Test)

Table 3: Effect of sowing date on the yield and yield components on three cowpea varieties infected with scab in 2005

Variety	Sowing date	Pod yield	Seed yield	Shelling %	Pod wt/ plant	Seed wt / plant	Pods/plant	Seeds/pod	100-seed weight
TVx3236	July-26	1111.10a	888.90a	78.65a	0.02a	0.01a	19.00a	11.00a	0.01a*
	August-02	834.60a	963.00a	78.00a	0.02a	0.01a	19.00a	11.00a	0.01a
	August-09	1592.60a	1259.20a	78.61a	0.03a	0.02a	21.00a	12.00a	0.01a
	August-16	1739.50a	1222.20a	80.73a	0.02a	0.02a	19.00a	13.00.a	0.01a
SAMPE-6	July-26	2209.90a	1543.20a	70.80a	0.03a	0.02a	17.00a	14.00a	0.02a
	August-02	2284.00a	1654.30a	73.50a	0.04a	0.03a	20.00a	17.00a	0.02a
	August-09	2530.90a	1802.50a	71.08a	0.04a	0.03a	24.00a	13.00a	0.02a
	August-16	2345.70a	1691.40a	72.07a	0.04a	0.03a	18.00a	14.00a	0.02a
T93K452-1	July-26	1555.57b	1185.17a	76.20a	0.03a	0.02a	23.00a	12.00a	0.02a
	August-02	1592.60b	1222.23a	76.60a	0.02a	0.02a	19.00a	13.00a	0.01a
	August-09	1679.00b	1283.93a	76.48a	0.02a	0.02a	23.00a	11.00a	0.02a
	August-16	1925.93a	1444.47a	72.33a	0.04a	0.03a	29.00a	13.00a	0.02a

*: Values in a column followed by the same letters are not significantly different at $p \leq 0.05$ (SNK Test)

August-26 plantings when compared to the other sowing dates. Shelling percentages for TVx3236 and IT93K452-1 were the same as in 2004 except for SAMPEA-6 that had a higher shelling % in the July-26 plantings when compared to the other showing dates (Table 4).

The correlation of scab infected plants parts with yield and yield components in 2004, 2005 and 2006 showed no correlation of leaf scab with yield and yield components for TVx 3236 (Table 5-7). In 2004, the correlation of scab on the different plant parts of TVx 3236 were inversely related with yield and yield components but a negative and highly significant correlation was observed for stem scab with number of pods/plant and seed yield ($r = -0.612$ and $r = -0.705$), peduncle scab with seed yield ($r = -0.786$) and pod scab with pod yield and seed yield ($r = -0.699$ and $r = -0.671$). The correlation of scab on the different plant parts of SAMPEA-6 with yield and yield components were weak and not significant, even though IT93K452-1 showed a negative and higher significant correlation of leaf scab, stem scab, flower cushion scab and pod scab with the number of pods/plant ($r = -0.596$, $r = -0.799$, $r = -0.710$ and $r = -0.655$, respectively) (Table 5). Flower cushion scab of TVx 3236 showed no correlation with yield and yield components in 2005.

Table 4: Effect of sowing date on the yield and yield components on three varieties of cowpea infected with scab in 2006

Variety	Sowing date	Pod yield	Seed yield	Shelling %	Pod wt/ plant	Seed wt/ plant	Pods/plant	Seeds/pod	100-seed weight
TVx3236	July-26	963.00a	728.40a	75.62a	0.02a	0.01a	15.00a	10.00b	0.01a*
	August-02	839.50a	642.00a	76.43a	0.02a	0.01a	17.00a	11.00a	0.01a
	August-09	864.20a	691.40a	81.21a	0.02a	0.01a	16.00a	11.00a	0.01a
	August-16	1098.80a	851.70a	77.37a	0.03a	0.02a	21.00a	13.00a	0.01a
SAMPEA6	July-26	1901.20a	1432.10a	75.31a	0.03a	0.02a	15.00a	12.00a	0.02a
	August-02	2370.70a	1765.40a	74.54a	0.04a	0.03a	14.00a	15.00a	0.02a
	August-09	1530.90a	1135.80a	74.05a	0.03a	0.02a	13.00a	12.00a	0.02a
	August-16	1481.50a	1108.60a	74.92a	0.02a	0.02a	10.00a	12.00a	0.02a
T93K452-1	July-26	827.20a	592.60a	71.37a	0.014a	0.01a	11.00a	11.00a	0.01a
	August-02	1049.40a	790.10a	75.05ab	0.017a	0.01a	13.00a	10.00a	0.01a
	August-09	716.00a	555.60a	77.54ab	0.019a	0.02a	14.00a	11.00a	0.02a
	August-16	1061.70a	876.50a	82.85a	0.025a	0.02a	17.00a	13.00a	0.02a

*: Values in a column followed by the same letters are not significantly different at $p \leq 0.05$ (SNK Test)

Table 5. Correlation coefficients of scab infected plant parts with yield and yield components of three cowpea varieties in 2004

Varieties	Yield and yield components	Scab on:				
		Leaf	Stem	Peduncle	Flower cushion	Pod
TVx3236	Pods/plant	0.000	-0.612*	-0.508	0.359	-0.082
	Seeds/pod	0.000	-0.238	-0.403	-0.418	-0.309
	100-seed weight	0.000	-0.246	-0.078	0.000	-0.447
	Pod yield	0.000	-0.493	-0.513	-0.024	-0.699*
	Seed yield	0.000	-0.705*	-0.786**	-0.004	-0.671*
SAMPEA-6	Pods/plant	-0.145	0.195	-0.035	-0.065	0.343
	Seeds/pod	0.362	0.343	0.256	0.048	-0.516
	100-seed weight	-0.207	0.065	-0.313	0.273	0.315
	Pod yield	0.073	-0.098	-0.059	-0.163	-0.236
	Seed yield	0.394	0.044	0.163	0.132	-0.125
IT93k4521	Pods/plant	0.596*	-0.799**	-0.505	-0.710**	-0.655*
	Seeds/pod	0.043	-0.278	0.042	-0.409	-0.439
	100-seed weight	-0.506	0.096	-0.049	-0.382	-0.109
	Pod yield	-0.450	-0.479	-0.213	-0.379	-0.087
	Seed yield	-0.510	-0.493	-0.263	-0.475	-0.160

*, **: The coefficients must exceed 0.576 and 0.708 to be significant at 0.05 and 0.01 probability levels respectively

Table 6.Correlation coefficients of scab infected plant parts with yield and yield components of three cowpea varieties in 2005

Varieties	Yield and yield components	Scab on:				
		Leaf	Stem	Peduncle	Flower cushion	Pod
TVx3236	Pods/plant	0.000	0.224	0.013	0.000	0.086
	Seeds/pod	0.000	-0.153	-0.090	0.000	-0.147
	100-seed weight	0.000	0.194	-0.304	0.000	-0.455
	Pod yield	0.000	-0.409	-0.356	0.000	-0.529
	Seed yield	0.000	-0.367	-0.186	0.000	-0.449
SAMPEA-6	Pods/plant	-0.270	-0.412	-0.412	-0.433	-0.092
	Seeds/pod	0.050	0.111	0.111	-0.094	0.259
	100-seed weight	-0.071	0.000	0.000	-0.419	-0.612*
	Pod yield	0.130	-0.195	-0.195	-0.093	-0.081
	Seed yield	0.160	-0.098	-0.098	-0.067	-0.130
IT93k4521	Pods/plant	-0.650*	-0.545	-0.381	-0.277	-0.009
	Seeds/pod	-0.306	-0.320	0.191	-0.230	-0.019
	100-seed weight	-0.298	-0.359	0.272	-0.217	-0.038
	Pod yield	-0.464	-0.657*	-0.464	-0.713**	-0.662*
	Seed yield	-0.377	-0.575	-0.431	-0.687*	-0.645*

*, **: The coefficients must exceed 0.576 and 0.708 to be significant at 0.05 and 0.01 probability levels respectively

The correlation of scab on the different plant parts of TVx3236 and SAMPEA-6 with yield and yield component were also weak and not significant but SAMPEA-6 showed a negative and highly significant correlation on pod scab with 100-seed weight (r = -0.612). Cowpea variety IT93K452-1, showed a negative and highly significant correlation on leaf scab with number of pods/plant (r = -0.650), stem scab with pod yield and seed yield (r = -0.657 and r = -0.575), and then flower cushion scab and pod scab with pod yield and seed yield (r = -0.713, r = -0.662 and r = -0.687 respectively). No significant correlation was observed with the other plant parts.

In 2006, except for leaf scab of TVx3236 that showed no correlation with yield and yield components, stem scab showed a negative and highly significant correlation with number of pods/plant and seeds/pod (r = -0.737 and r = -0.630), peduncle scab with 100-seed weight (r = -0.617), flower cushion scab with pod yield (r = -0.580) and pod scab with 100-seed weight (r = -0.827).

Table 7: Correlation coefficients of scab infected plant parts with yield and yield components of three cowpea in 2006

		Scab on:				
Varieties	Yield and yield components	Leaf	Stem	Peduncle	Flower cushion	Pod
TVx3236	Pods/plant	0.000	-0.737**	-0.170	-0.017	-0.360
	Seeds/pod	0.000	0.630*	-0.110	0.114	-0.364
	100-seed weight	0.000	-0.521	-0.617*	0.510	-0.827**
	Pod yield	0.000	-0.263	0.371	0.580*	0.056
	Seed yield	0.000	-0.256	0.368	0.552	0.000
SAMPEA-6	Pods/plant	0.300	-0.029	0.231	-0.122	0.465
	Seeds/pod	0.203	-0.176	-0.094	-0.497	-0.251
	100-seed weight	0.660*	0.508	0.339	0.255	0.641*
	Pod yield	0.072	-0.167	0.013	-0.687*	-0.297
	Seed yield	0.069	-0.181	-0.009	-0.688*	-0.285
IT93k4521	Pods/plant	-0.067	-0.228	-0.108	-0.486	-0.637*
	Seeds/pod	-0.055	0.003	-0.184	-0.270	-0.260
	100-seed weight	-0.216	-0.186	-0.571	-0.357	-0.143
	Pod yield	-0.048	0.103	-0.022	-0.215	-0.279
	Seed yield	-0.124	-0.076	-0.076	-0.330	-0.392

*, **: The coefficients must exceed 0.576 and 0.708 to be significant at 0.05 and 0.01 probability levels respectively

SAMPEA-6 showed a negative and high significant correlation of leaf scab and pod scab with 100-seed weight (r = -0.660, r = -0.641), flower cushion scab with pod yield and seed yield (r = -0.687 and r = -0.688). No significant correlations were observed on the other plant parts. The correlation of scab on the different plant parts of IT93K452-1 was not significant but pod scab showed a negative and highly significant correlation with number of pods/plant (r = -0.637) (Table 7).

DISCUSSION

Higher disease incidences from scab infection were recorded on the early sown cowpeas than the late sown crops. This is in agreement with earlier reports, which showed an increase in the infection of some diseases as a result of early sowing of cowpeas (Mungo, 1996; Alabi, 1994). This early incidence of scab infection may be attributed to changes in the microclimate of the environment, within the plant community, which might have favoured early disease development. This also confirms previous reports (Emechebe, 1980; Edema *et al*., 1997), that scab is more severe under wet conditions.

The effect of sowing date on the yields and yield components of the three cowpea varieties infected with scab indicated that early sown cowpea had lower yields and yield components for the varieties, TVx 3236 and IT93K452-1 than late sown crops. Grain yield of early sown cowpea were lower in quantity and of poor quality than those of late sown crops, which were higher in quantity and of good quality. This confirms a previous report (Mungo, 1996) even though a study on brown blotch of cowpea by Alabi (1994) showed that seeds from late sown plots were higher in quality than those from early sown plots. The cultivar SAMPEA-6 showed higher yield and yield components with the first week of August plantings than with the fourth week of July or second and third weeks of August plantings. Generally, early sown crops had a higher yield than late sown crops for SAMPEA-6. This was in agreement with earlier reports (Gurama *et al*., 1998). The yield components of SAMPEA-6 did not follow the pattern of these reports but the first week of August proved better. Since SAMPEA-6 is susceptible to scab and IT93K452-1 is moderately susceptible, reduction in yields and yield components of early sown cowpea (IT93K452-1) and late sown cowpea (SAMPEA-6) could be attributed to the adverse effects of scab on the peduncles, flower cushions and pods. Also early sown crops had visible scab symptoms on the pods compared to late sown crops. Some pods were deformed and transformed into mummies and pod abortion was also prominent. This was in agreement with earlier reports of other researchers (Emechebe, 1980; Iceduna, 1993; Gurama *et al*., 1998; Mungo, 1996) that worked on scab of cowpea. Since TVx 3236 is moderately resistant to scab a reduction in yield could be attributed to other factors.

Correlation of the scab infected plant parts in the three varieties was not consistent but TVx3236 maintained a consistent pattern with leaf scab that showed no correlation with yield and yield components in all the years. In 2005, flower cushion scab showed no correlation with yield and yield components. This could be as a result of similar genes or genetic mechanisms involved in the inheritance of resistance to the two types of scab infection. Studies of genetic of resistance to scab by Tumwegamire *et al*. (1998), showed that foliar and pod scab have similar genes involved in the resistance of scab infection. All the scab infected plant parts of TVx3236 showed negative correlation with yield and yield components in all the years except the correlation between flower cushion and pods/plant that were positive. A lot of variations were observed in all the years for the three varieties. The correlation of susceptible cowpea varieties to scab whether positive or negative affects the yield of cowpea. This confirms similar reports by Barreto *et al*. (2001), which in scab susceptible plants the disease negatively or positively affects both the cycle and yield.

Gurama *et al.* (1998) also reported that the negative correlation indicated that as the disease increased on the plant, yield and yield components reduce. Even though the correlation of scab infected plant parts of SAMPEA-6 were of low magnitude, there existed strong and positive correlations of scab infected plant parts with yield and yield components. Peduncle scab, flower cushion scab and pod scab of SAMPEA-6 exhibited the highest correlation coefficient with pod and seed yields, followed by seeds/pod, pods/plant and 100-seed weight. This suggests that peduncles, flower cushions and pods and the latter yield components are the major yield factors in cowpea. This also confirms earlier reports by Tumwegamire *et al.* (1998), that the number of peduncles, pods/plant, seeds/pod, seed weight, number of branches and pod length are the major factors in cowpea. Pod scab of IT93K452-1 maintained the same pattern as SAMPEA-6 with yield and yield components but some variations were observed with peduncle and flower cushion. TVx 3236 showed a high correlation of stem and pod scab with pods/plant, seeds/pod pod and seed yields.

The results suggest deleterious effects of sowing dates variation on pod and seed yields of cowpea in the three varieties in all the years. Some variations were observed with IT93K452-1 that showed negative correlations of leaf scab, stem scab, and peduncle scab with seeds/pod and 100-seed weight and also flower cushion with 100-seed weight. Positive correlations were obtained for pods/plant, pod and seed yields. These variations may be attributed to the early maturity of this variety. Marked differences were observed in correlation coefficients in the three cowpea varieties with SAMPEA-6 recording a high correlation of scab infected plant parts with yield and yield components, followed by IT93K452-1 and TVx 3236 showed a lower correlation of scab infection.

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