

Assessment of Field Insect Pests Damage on Cowpea in Gombe State, Nigeria**Samaila, A. E., Degri, M. M. and Mshelia, J. S.**

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ABSTRACT: Survey of cowpea growing areas in the Eleven (11) Local Government Areas of Gombe State was carried out. Ten (10) communities each were sampled in Akko, Balanga, Yamaltu, Deba, Kaltungo, Nafada, Bajoka, Billiri, Kwami and Gombe Local Government Areas in 2017 and 2018 cropping seasons. The objective was to establish pest incidence and level of damage caused by insect pests in farmers' fields. Questionnaires and discussions with practicing farmers, state agricultural extension workers from 107 sample sites, 100 cowpea pods were selected at random and analyzed for percentage pod damage by pod borers and pod sucking bugs. The cropping systems in which cowpea was grown were noted and percentage seed losses due to pests from each cropping system were analyzed and recorded. From the results, major insect pests encountered during the field visits were: foliage beetles, ants, termites, flower pests [thrips (*Megalurothrips usitatus*) and blister beetle (*Mylabris pustulata*)], pod borers (*Helicoverpa armigera*, *Maruca testulalis*, *Etiella zinckenella*), pod sucking bugs (*Anoplocnemis curvipes*, *Riptortus dentipes*, *Clavigralla tomentosicollis*, *Nezara viridula*), aphids (*Aphis craccivora*), and leaf damaging weevils (*Myllocerus undecimpustulatus*). Results also revealed that mean damage by pod sucking bugs was highest in Balanga (74.74%), Kwami (90.4%) and Yamaltu/Deba (91.04%) and least in Balanga (48%) than the damage by pod borers in all the communities surveyed. Among the cropping systems observed in the areas, cowpea/maize intercrop recorded greater damage by pod borers than pod sucking bugs while cowpea/millet intercrop had the least damage by pod borers and pod sucking bugs followed by sole cropping.

Key Words: Insects pests, cowpea, pod borers, sucking bugs, damage, cropping systems

INTRODUCTION

Cowpea is mainly grown in tropical and sub-tropical regions in the world for vegetable and grains and to lesser extent as a fodder crop. It is a most versatile pulse crop because of its smothering nature, drought tolerant characters, soil restoring properties and multi-purpose uses. Cowpea is a hardy crop but it hosts many insect pests that attack vegetables. These include; leaf miners, whiteflies (*Bemisia tabaci*), leafhoppers (*Empoasca* sp.), mites (*Tetranychus* spp.), thrips (*Megalurothrips sjostedti*), *Ootheca* sp., *Clavigralla* sp., *Maruca* sp. and aphids (*Aphis craccivora*) which generally cause low yield and sometimes total yield losses and crop failure occur due to the activities of a spectrum of insect pests which ravage the crop in the field at different growth stages (Oyewale and Bamaiyi, (2013).

Cowpea, *Vigna unguiculata* (L.) Walp., is an important grain legume of the tropics. It is a climbing annual crop belonging to the family Fabaceae and mostly grown for its edible seeds

and pods. The cowpea plant is usually erect and possess ribbed stems and smooth trifoliate leaves which are arranged alternately on the stems (CABI, 2008). The plant produces clusters of flowers at the end of a peduncle (flower stalk) and 2–3 seed pods per peduncle. When the seeds reach maturity the pod changes colour to yellowish brown. The seeds can be white, cream, red brown or black in colour or be a mottled combination. The seed may also possess an ‘eye’ where a lighter colour is surrounded by one that is darker (Quin, 2014). Cowpea can reach in excess of 80 cm (31.5 in) in height and, as an annual plant, lives for only one growing season before harvest. Cowpea may also be referred to as black-eyed pea, southern pea, crowder pea or field pea and originates from Africa. Cowpea is an important grain legume in Africa, parts of the Americas and in Asia. The seeds can be consumed fresh along with the pods and leaves as a vegetable. Dried seeds are consumed after cooking. The plant can be used as a forage or for hay or silage (Schwartz, *et al.*, (2008).

Cowpea is mainly grown in tropical and subtropical regions in the world for vegetable and grain and to lesser extent as a fodder crop. It is a most versatile pulse crop because of its smothering nature, drought tolerant characters, soil restoring properties and multipurpose uses. More than 11 million hectares are harvested worldwide, 97% of which is in Africa (Oyewale and Bamaiyi, 2013). Nigeria cultivates 4.5million hectares annually representing over 60% of total production. The crop can be harvested in three stages; while the pods are young and green, mature and green and dry. The grain yield of cowpea in Nigeria is 700kg/ha (FAO STAT, 2011). The highest production of cowpea comes from the northern states of Nigeria (about 1.7 million tonnes from 4 million hectares), Oyewale and Bamaiyi, (2013).

The main producing areas in Nigeria are within the Guinea and Sudan savannas (Mongu, 1996). Even though appreciable quantities are grown in the rain forest belts, particularly in the South West, which has two (2) growing seasons, namely; early (March – July) and late (August – November) (Oyewale, and Bamaiyi, 2013). The major producing states in Nigeria include; Kaduna, Katsina, Zamfara, Bauchi, Sokoto, Kebbi, Plateau, Borno, Yobe, Jigawa, Niger, Benue, Nasarawa and Kano where most cowpeas are traditionally grown as intercrops with cereals such as millet, maize and sorghum (Oyewale, and Bamaiyi, 2013; Emechebe and Singh, 2013 and Chemada, 1997). In this system, the yields are low; inter-specific competition is high, population density is undetermined and harvesting is complicated by differing maturities of the intercrops (Singh, *et al.*, 1997) estimated a world total area of about 12.5 million hectares grown to cowpea annually. The food and Agricultural Organization of United Nations (FAO) estimated a production of more than 5.2 million metric tonnes of dry cowpea grains worldwide in the year 2010 (FAO STAT, 2011).

It is an inexpensive source of vegetable protein, and a hardy crop well adapted to relatively dry environments (Alghali 1992; Rachie 1985). The crop is also important in soil fertility improvement, and is reported to fix up to about 70 kg N/ha/year (Palaniappan 1984). This capacity of fixing nitrogen is particularly important with subsistence oriented farming systems where the use of inorganic fertilisers is virtually non-existent (Adipala, *et al.*, 2000). More than 5.4 million tons of dried cowpeas are produced worldwide, with Africa producing nearly 5.2 million. Nigeria, the largest producer and consumer, accounts for 61% of production in Africa and 58% worldwide. Africa exports and imports insignificant amount

(Adipala, *et al.*, 2000). Recent studies have indicated that insect pests are the major production constraint (Oyewale and Bamaiyi, 2013). They further reported that aphids (*Aphis craccivora* Koch), thrips (*Megalurothrips sjostedti* Trybom), legume pod borers (*Maruca vitrata* Fab. Syn. *Maruca testulalis* Geyer) and a complex of pod sucking bugs are the most important. Another study source aimed at understanding production and pest management rationale of different cowpea farmer categories documented that farmers do recognise insect pests as the most serious constraint to cowpea production (Isubikalu 1998 and Adipala, *et al.*, 2000).

Cowpea cropping systems

The predominance of mixed cropping systems in developing countries of the tropics and subtropics and northern Nigeria in particular was reported by (Norman, 1972). The advantages attached to these practices include profit maximization (Oyewale and Bamaiyi, 2013), more efficient use of labour and land, reduction of soil erosion, yield stability and risk minimization (Emechebe and Singh, 2013). Small scale farmers constitute the majority in Northern Nigeria, and where large scale farmers are found, they mostly practice monocropping. With increase in population, the demand for land has also increased, resulting in intense cultivation with little or no fallow periods, hence the need for intercropping (Weber, *et al.*, (1996). About 83 % of the cultivated area in northern Nigeria has been devoted to mixed- cropping (Willey and Osiru, (1972). The popularity of maize and cowpea mixtures has been reported in the Savannah region of Nigeria (Oyewale and Bamaiyi, 2013). Mixed cropping is used to include terms similar in meaning as inter-planting (the partial mixing of crops where by a crop or crops are sown and harvested after another crop in the mixture and relay cropping, where the second crop is sown into a standing crop at a time when the standing crop is at its reproductive stage but before harvesting (Oyewale and Bamaiyi, 2013).

Pests of cowpea

Plant insect pests, diseases and weeds impose a serious threat to crop production in Nigeria. Population of weeds, insect pests and diseases have increased over the years especially by the introduction of monoculture farming in the country (Jakai and Adalla, 1997). Traditionally, Nigerian farmers have been relying heavily on pesticides for the control of various weeds, insect pests and diseases, leading to the high importation of these products and their price have become so high that it is becoming impossible for local farmers to afford (Emosairue and Ubana, 1998; Nwanze, 1991; Schwab, *et al.*, 2010 and Van de and Nur, 1998). These have created the need for alternatives to synthetic pesticides. But inadequate infrastructure for research and extension remains a constraint to the advancement and continuity of such important activity in the country (Okrikata and Anaso, 2008).

The major pests of cowpea in the field in northern Nigeria, Niger, and Burkina Faso include: the legume pod borer, *Maruca vitrata* Fabricius; the coreid pod-bugs, *Clavigralla tomentosicollis* Stal and *Anoplocnemis curvipes* (F.); the groundnut aphid, *Aphis craccivora* Koch; and, thrips, *Megalurothrips sjostedti* Trybom and *Sericothrips occipitalis* Hood. A limited amount of work has been done to understand these insect pests in these areas (Oyewale and Bamaiyi, 2013).

Considering the major constraints posed by insect pests, a survey aimed at identifying insect pests that attack cowpea across Gombe State in Northeastern Nigeria, was carried out in order to assess the abundance and diversity of insects associated with pulses in farmers' field. Despite the importance of cowpea in Gombe State's nutritional and economic value, little or no attention is given on the pests of this crop. There is paucity of literature on the field insect pests of cowpea in Gombe State. Therefore, the need to provide data base of the field insects pests associated with cowpea in the study area with the hope of establishing a bedrock for further scientific research that could be used as a guide in proffering control measures for the field insect pests in Gombe State – Nigeria.

MATERIALS AND METHODS

In 2017 and 2018, a team of researchers from the Federal University of Kashere, Nigeria carried out field survey to cowpea growing areas in Gombe State, Nigeria. The team comprised of entomologists, Agronomists and extensionists. Questionnaires were used to obtain necessary information from farmers. Other sources of information during the survey include discussions with State Extension workers, practicing farmers and individuals familiar with cowpea production.

Cowpea farmers from the eleven (11) Local Government Areas of Gombe State, namely: Akko, Balanga, Billiri, Dukku, Funakaye, Gombe, Kaltungo, Kwami, Nafada, Yamaltu/Deba, and Shonghom were visited and interviewed. Some plants from 107 farmers' fields were carefully examined and records were made on the incidence of insect pests. From 107 sampling sites, 100 pods each were selected at random, weighed in the laboratory using an Atomic Electronic Compact scale A-120 weighing scale and analyzed for percentage pod damage by insect pests. Insect pests were also collected and preserved in a specimen bottle containing 98% ethyl alcohol. These specimens were identified in the laboratory. Infected plants were also collected and examined for disease incidence in the laboratory of the Agronomy Department, Federal University of Kashere, in Gombe State.

RESULTS

Gombe State is one of the 36 states of the Federal Republic of Nigeria, located in the centre of the north east of the country on latitude 9°30' and 12°30' N, Longitude 8°5' and 11°45' E. Topographically, Gombe State is mainly mountainous, undulating and hilly to the South-East and flat open plains in the Central, North, North-East, West and North-West. It has an area of 20, 265 Square kilometres with a population of 2.4 Million with its Capital in Gombe. It is located in the north eastern zone, right within the expansive savannah region and shares a common boundary with the states of Borno, Taraba, Adamawa and Bauchi. Gombe has two distinct climates, the dry season (November-April) and the rainy season (May-October) with an average rainfall of 850 mm Gombe State Diary, 2018).

While crisscrossing through the state, mixed cropping is observed in intensity. In Gombe State, there are a good number of large-scale farms for the production of local cowpea in sole stands. Cowpea is among the major staple crops in addition to soybean and groundnut. Bush fallowing has given way to continuous cropping, which has resulted to mixed farming, as

observed throughout the survey period. The farms are cultivated with crops such as watermelon, groundnut, maize, pumpkin, guinea corn, maize, beniseed, millet and often with or without cowpea.

Major insect pests observed in farmers' fields.

Farmers' fields within the study area cultivate different cultivars/varieties of cowpea, local cowpea cultivars with different heights and canopy development were also observed. Farmers usually plant cowpea in June, July or August, depending on the cultivar or variety and often harvest the pods from late October through December. The insects observed and recorded were foliage beetles (*Oothea mutabilis*), whitefly (*Bemisia tabaci*), leafhoppers (*Empoasca kraemeri*, *E. fascialis*), scale insects (*Ceroplastodes cajani*), termites (*Odontotermes* sp), aphids (*Aphis craccivora*), leaf damaging weevils (*Myloccerus undecimpustulatus*), lepidopteran borers such as pod borers (*Helicoverpa armigera*, *Etiella zinckenella*, *Maruca testulalis*), flower pests thrips (*Megalurothrips usitatus*) and blister beetle (*Mylabris pustulata*), pod sucking bugs (*Anoplocnemis curvipes*, *Riptortus dentipes* and *Clavigralla tomentosicollis*, *Nezara viridula*).

Though farmers did not report significant losses due to insect damage, all stages of pod sucking bugs especially, *Clavigralla* spp and *Riptortus dentipes* were observed on the pods. There were eggs of *H. armigera* in all the flowers examined. *Mylabris* spp were observed on flowers in almost all the areas visited, but pod damage was most prominent on cowpea caused by pod sucking bugs particularly, *Clavigralla* spp and *Riptortus* spp. There is variation from Local Government Area to another and from one village to another with respect to cowpea pod damage by pod borers (*H. armigera*) and pod sucking bugs (*R. dentipes* and *C. tomentosicollis*). Major diseases identified include fusarium wilt (*Fusarium udum*), root rot (*Sclerotium rolfsii*) and angular leafspot (*Phaeisariopsis griseola*).

Results from Table 1 reveals that pod borer caused greater average damage of 40.21 % to cowpea pods at Talase village in Balanga Local Government Area, compared to other villages. At village level, pod sucking bugs comprising *C. tomentosicollis* and *R. dentipes* recorded the highest damage of 94.10% to cowpea pods at Gaji Bauchi village in Kwami Local Government Area. On average, from the two years field data, pod sucking bugs caused 82.44 % damage to cowpea pods in Kwami LGA, which is greater when compared to all other LGAs visited, while pod borers caused 15.50 % pod damage.

From the results in Table 1 below, pod borer (*H. armigera*) with highest pod damage of 25.08 % occurred in Gaji Bauchi while pod sucking bugs (mostly *C. tomentosicollis* and *R. dentipes*) caused 94.10 % to cowpea pods at Gaji Bauchi village in Kwami Local Government Area. The study further showed that on average pod sucking bugs caused 74.12 % damage to cowpea pods while pod borers caused 11.52 % pod damage. Furthermore, results revealed that on average *H. armigera* caused 20.02 % pod damage in within the study area, while pod sucking bugs with highest pod damage of 89.50 % also occurred at Akko Local Government Area.

However, the average pod damage in Balanga LGA was 18.20 % by pod borers and 90.84 %

by pod sucking bugs, while *H. Armigera* caused the highest damage of 30.21 % to cowpea pods at Wuro Bogga village of Nafada LGA. The highest damage of 91.60 % by pod sucking bugs was observed at Pindiga in Akko LGA. On average of the two years field survey, pod borers caused 27.50 % damage and pod sucking bugs caused 74.44 % damage within the study area.

The Table below shows that in *H. armigera* caused more damage to cowpea pods at Kuri village in Yamultu/Deba LGA (36.60 %) and 27.57 % in Kurjale village of Yamultu/Deba LGA, while on average the damage by pod sucking bugs was highest in Kurjale village of Yamultu/Deba LGA (78.34%) and Garin Bako Village as well as Kaluwa villages in Kaltungo Local Government Area (78.27%). During 2017 and 2018 field surveys, the mean pod damage by pod borers was 17.44% while it was 53.69% by pod sucking bugs. Results revealed that at Shela village in Billiri LGA, *H. armigera* caused highest damage of 18.15 % to cowpea pods, while pod sucking bugs caused the highest damage at Shela (90.84 %) in Billiri Local Government Area. Pod sucking bugs caused mean damage of 74.12 % during 2017 and 2018 while pod borers caused 16.50 % damage.

Table 1 revealed that cowpea intercropped with maize is most susceptible to pod borers (10.18 % damage) and pod sucking bugs (74.82 % damage). Also pod damage in sole cowpea and cowpea/maize intercrop was higher when compared to that in cowpea intercropped with millet, etc. Pod damage was minimum in cowpea/millet intercrop followed by cowpea/sole.

DISCUSSION

Throughout the study, pod sucking bugs caused greater damage to cowpea pods particularly in Balanga LGAs. In Kaltungo, Akko and Billiri LGAs where large areas of cowpea are grown, often as monocrop while in Yamultu/Deba, Dukku and Nafada LGAs cowpeas are intercropped with cereals or other seed crops like sesame and seldom planted in scattered plots in farmlands. The high damage by pod sucking bugs (*C. tomentosicollis*) was predominant in Kwami LGA and *R. Dentipes* was important in Yamultu/Deba LGA. This is to be expected as the pests experienced free movement due to sole cowpea crop, which favored feeding and oviposition. Study carried out in cowpea growing areas in Northwestern Nigeria in 2013 by Oyewale and Bamaiyi, (2013) revealed that insect pests particularly pod sucking bugs (*Clavigralla gibbosa*) are the major cowpea yield reducers. Within the study area, pod borers (particularly *H. armigera*) are considered to be low compared to pod sucking bugs. Variation of rainfall within the period of research and the harsh harmattan weather probably enhanced the mortality of growth stages of *H. armigera*. On the other hand the mean percentage pod damage by *R. dentipes*, *C. tomentosicollis* and *H. armigera* were generally considered to be low as in Dukku, Funakaye and Nafada LGAs and millet intercrops may have been influenced by some factors related to the inability of the insects to locate their host easily in a diversified ecosystem, as a kind of pseudo-resistance as described by Painter (1985) and Norris and Kogan (1980).

Table 1. Insect pests damage to cowpea pods in Gombe State, Nigeria, 2017 and 2018.

LGA/Village	Pod Borer Damage 2017/2018 Mean			Pod Sucking Damage 2017/2018 Mean		
	Cowpea	Cowpea/Maize	Cowpea/Millet	Cowpea	Cowpea/Maize	Cowpea/Millet
Akko						
Akko	4.00	9.45	4.60	65.96	83.20	72.63
Garko	7.50	13.05	6.30	76.40	79.48	57.78
Kalshingi	5.80	17.79	4.95	71.64	78.92	66.31
Kashere	4.50	20.02	4.15	69.38	84.21	55.81
Tukulma	2.80	17.03	3.30	59.64	78.51	78.59
Wuro Dole	3.90	17.57	4.10	69.80	89.50	69.55
Tumu	6.60	10.40	7.30	77.80	77.68	65.00
Pindiga	2.90	16.06	3.80	66.90	91.60	62.97
Labondo	5.20	14.19	5.60	55.90	79.52	43.14
Kumo	4.30	17.86	5.00	65.24	68.94	60.89
Balanga						
Bambam	5.10	19.44	4.50	90.84	81.51	42.29
Bangu	5.30	11.70	4.62	68.53	79.04	55.75
Latakulan	1.87	10.10	2.92	90.60	84.88	52.13
Gelengu	3.50	12.00	4.00	86.42	76.34	41.74
Yolde	12.82	16.00	14.07	78.90	84.55	50.30
Cham	13.22	19.60	13.95	73.79	87.96	42.87
Kutare	10.80	15.70	9.54	87.90	78.29	42.03
Chunyi	14.39	18.13	15.15	84.87	82.70	44.70

Ayaba	12.67	19.20	14.42	79.61	83.71	52.35
Talase	11.46	40.21	10.50	79.58	76.91	50.26
Billiri						
Baganje	2.99	18.15	3.89	84.17	65.66	55.00
Polpandi	6.97	12.49	5.36	79.60	69.33	62.26
Sabongari	7.74	12.66	6.43	88.36	78.61	59.89
Lodongor	4.24	16.54	4.47	69.48	69.93	49.54
Kufai	6.32	13.55	5.14	73.41	66.51	52.13
Kalmai	3.30	12.45	4.05	88.73	60.98	62.06
Buye	4.83	11.83	4.34	79.81	62.06	73.40
Lakalkal	5.04	17.70	3.90	78.60	73.40	70.40
Shela	6.00	13.57	5.03	90.84	70.40	62.40
Tudun Kwaya	4.91	15.17	5.37	68.53	62.40	67.93
Dukku						
Maru	2.78	15.08	4.03	86.42	62.73	65.66
Dokolo	6.25	20.80	6.28	78.90	72.70	69.33
Kaloma	5.10	10.92	5.84	73.79	80.82	78.61
Madaki	5.00	13.06	5.26	87.90	68.21	69.93
Gajigala	4.09	14.75	5.20	84.87	63.54	66.51
Wurojada	3.80	16.44	6.47	79.61	62.31	60.98
Waloyi	3.00	15.60	6.04	79.58	54.32	62.06
Jamari	4.20	10.14	5.39	68.59	69.00	73.40
Bawa	7.90	19.21	5.66	65.96	73.80	70.40
Zego	4.70	10.14	6.09	76.40	68.80	62.40

Funakaye						
Bula Gaidam	5.20	4.34	6.30	71.64	56.00	84.88
Jalingo	6.18	7.20	6.20	69.38	59.51	76.34
Worker's Village	5.60	6.66	5.85	59.64	63.03	84.55
Wawa	6.27	6.50	15.56	69.80	52.16	87.96
Wuro Zarma	5.58	6.80	23.04	77.80	48.08	78.29
Magaba	3.98	6.86	18.15	66.90	49.60	82.70
Dayayi	4.45	5.88	12.49	55.90	49.33	83.71
Ashaka	6.30	5.30	12.66	65.24	38.66	76.91
Bajoga	7.20	5.00	16.54	62.73	50.15	83.65
Manawashi	7.40	6.10	13.55	72.70	49.12	78.29
 Gombe						
Gombe	5.82	5.84	15.56	79.81	38.70	81.51
Arawa	6.48	5.26	23.04	78.60	61.24	79.04
Doma	4.34	5.20	18.15	90.84	66.82	84.88
Gabukku	7.20	6.47	12.49	68.53	63.55	88.36
Inna	6.66	6.04	12.66	90.60	62.51	83.28
Manawashi	6.50	6.30	16.54	86.42	52.46	82.04
Pantami	6.80	6.20	13.55	78.90	80.60	74.19
 Kaltungo						
Dogon-ruwa	15.00	4.34	15.56	84.17	66.82	68.50
Garin Bako	21.00	7.20	23.04	79.60	63.55	76.35
Nahuta	15.70	6.66	18.15	88.36	62.51	82.90
Kaluwa	14.05	6.50	12.49	69.48	52.46	83.90
Kannu	12.26	6.80	12.66	73.41	80.60	78.85

Galadima Yiri	18.32	6.86	16.54	88.73	73.10	80.50
Bwatai	10.66	5.88	13.55	67.80	68.00	75.65
Kunini	9.29	5.30	12.45	73.20	69.04	75.20
Pokwanli	13.51	5.00	11.83	80.36	39.78	79.44
Ture Balam	16.18	6.10	17.70	86.55	61.44	81.94
Kwami						
Durokono	17.00	5.12	18.15	89.30	42.29	91.45
Daba	14.82	4.70	12.49	75.30	55.75	76.60
Doho	6.11	3.95	12.66	73.50	72.63	77.10
Gaji Bauchi	25.08	4.79	16.54	89.90	57.78	94.10
Koboza	20.80	3.85	13.55	66.30	66.31	68.50
Jurara	10.92	2.75	12.45	70.80	55.81	76.35
Bula Barde	13.06	4.05	11.83	75.00	78.59	91.45
Kwami	14.75	5.83	17.70	88.00	69.55	76.60
Mallam Sidi	16.44	5.27	13.57	69.90	65.00	77.10
Bappa	15.60	6.27	15.17	77.40	62.97	93.10
Nafada						
Barwo	19.44	5.10	18.55	91.45	49.54	68.50
Feshingo	11.70	5.00	12.35	76.60	52.13	76.35
Gulmari	10.10	4.09	9.45	77.10	41.74	82.90
Ungwan Barde	12.00	3.80	13.05	93.10	50.30	83.90
Gwandum	16.00	3.00	17.79	68.50	42.87	78.85
Denlele	19.60	4.20	20.02	76.35	42.03	80.50
Sodangi	15.70	7.90	17.03	82.90	44.70	75.65
Sabon Sara	28.13	4.70	27.57	83.90	52.35	75.20

Nafada	19.20	6.00	10.40	78.85	50.26	79.44
Wuro Bogga	30.21	5.60	36.06	80.50	59.89	81.94
Yamultu/Deba						
Deba	9.45	3.30	14.19	68.50	65.66	81.51
Difa	13.05	4.10	17.86	76.35	69.33	79.04
Mshelkala	17.79	7.30	18.15	82.90	78.61	84.88
Dadinkowa	20.02	3.80	12.49	83.90	69.93	76.34
Tuwirwa	17.03	5.60	12.66	78.85	66.51	84.55
Kurjale	27.57	5.00	16.54	80.50	60.98	87.96
Kachalai	10.40	4.50	13.55	75.65	62.06	78.29
Kuri	36.06	4.62	12.45	75.20	73.40	82.70
Gadawo	14.19	2.92	11.83	79.44	70.40	83.71
Kwali	17.86	4.00	17.70	81.94	62.40	76.91
Shonghom						
Nebang	15.70	14.07	5.84	81.51	84.88	69.33
Pokata	14.05	13.95	5.26	79.04	76.34	78.61
Kwanan	12.26	9.54	5.20	84.88	84.55	69.93
Filiya	18.32	15.15	6.47	76.34	87.96	66.51
Dwaja	10.66	14.42	6.04	84.55	78.29	60.98
Kurmi	9.29	10.50	5.39	87.96	82.70	62.06
Kulishin	13.51	15.31	5.66	78.29	83.71	73.40
Gomle	16.18	14.67	6.09	82.70	76.91	70.40
Latatar	17.00	8.28	6.30	83.71	83.65	62.40
Labayo	14.82	15.90	6.20	76.91	78.29	67.93

CONCLUSION AND RECOMMENDATION

There was incidence of different species of insect pests in cowpea growing areas surveyed in Gombe State, with the highest percentage of pod damage being observed in Balanga, Kwami and Yamaltu/Deba LGAs. These LGAs grow sole crops of cowpea and so farmers in these areas should adopt the system of planting cowpea in mixture with other crops, particularly millet to help minimize the incidence of pod sucking bugs and pod borers in cowpea pods. Efforts should be made to encourage researchers within the study area and particularly in the Northeastern corner of Nigeria to examine the biotic/abiotic constraints of cultivating short-duration cowpea within the study area and develop breeding strategies considering the desirable qualities required by farmers and consumers. In this way, short-duration cowpea cultivars/varieties will gradually become popular in the farming systems of most of the farmers within the study area.

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