World Journal of Advanced Research and Reviews
eISSN: 2581-9615 CODEN (USA): WJARAI
Cross Ref DOI: 10.30574/wjarr
Journal homepage: https://wjarr.com/

(RESEARCH ARTICLE)

Check for updates

Identification and characterization of the main invasive insects of corn, beans and peanut crops in Dimuca commune, municipality of Neg age, Urge-Angola

Nzayadio MAMPASI [1, 2] and Bettencourt de Jesus Coxe MUNANGA [3, *]

[1] *Department of Agronomy, Polytechnic Institute, Kimpa Vita University, Uíge, Angola.*
[2] *Department of Agricultural Sciences, Environment and Fisheries of the Polytechnic Institute of Cuanza Sul.*
[3] *Department of Food Sciences, Department of Process Engineering, Department of Biological Sciences, Rainha Njinga a Mbande University, Malanje, Angola.*

World Journal of Advanced Research and Reviews, 2025, 26(03), 675-686

Publication history: Received on 23 April 2025; revised on 01 June 2025; accepted on 04 June 2025

Article DOI: https://doi.org/10.30574/wjarr.2025.26.3.2156

Abstract

The invasion of crops by insect pests' results in economic losses for a large number of farming families. In this context, the present study was carried out with the aim of characterizing the invasive insects in 3 annual crops (Corn, Beans and Peanuts) in the community of Dimuca in the province of Uíge. The research was carried out between January and June 2023. The research was conducted through an interview based on a questionnaire, and direct observation of insect pests and their damage. 402 peasants were interviewed, 261.3 women and 140.7 men. The main insect pests that attack corn, bean and peanut crops in the study area were: Formicidae sp., *Brachytrupes membranaceus*, *Spodoptera frugiperda*, *Elasmopalpus lignosellus*, *Agrotis ipsilon*, *Bemisia tabaci*, *Euschistus* sp., *Rhopalosiphum* sp., *Schistocerca* sp., *Zonocerus variegatus*, characterized by having chewing and sucking mouthparts, attacking agricultural crops in almost all phenological stages, with greater emphasis on germination and growth 24% and 19% respectively for corn and peanuts; growth to flowering 24% and 19% respectively for corn and beans; from growth to harvest 24%, 24% and 19% respectively for peanuts, beans and corn. The most attacked crop organs were the leaves (62%) and seeds (51%) of beans; peanut seeds with 46%. Only 21.6% of farmers combat insect pests using ash, castor oil, tobacco and pepper. Using local bio-pesticide plants to protect crops against insect pests would provide excellent harvests.

Keywords: Identification; Invasive Insects; Annual Crops; Dimuca Commune

1. Introduction

The main annual crops historically cultivated in rain-fed areas are beans (*Phaseolus vulgaris*), cassava (*Manihot esculenta* Crantz), corn (*Zea mays*), peanuts (*Arachis hypogaea*), sorghum (*Sorghum bicolor*) and sweet potatoes (*Ipomoea batatas*) (Silva & Neto, 2019). Annual crops play a great socioeconomic role in Angola, as in most developing countries.

In Angola, family farmers occupy 99.6% of the total cultivated land (De Melo et al., 2021). However, these fields are generally attacked by pests and diseases, causing direct and indirect damage that results in crop losses and low commercial value of the products, which translates into economic losses for a large part of the peasant families (ACDI, 2016)

The economic losses caused by these insects in crops can reach several thousand dollars annually, worsening when crops are grown in areas with sandy soils and a history of infestation (Khan, Fahad, Naushad, & Faisal, 2020). For crops, a seedling infestation rate of 10 to 20% represents a reduction in grain production. For legume crops, the reduction in

* Corresponding author: Bettencourt de Jesus Coxe MUNANGA

Copyright © 2025 Author(s) retain the copyright of this article. This article is published under the terms of the Creative Commons Attribution License 4.0.

the number of plants due to pest attacks, result in economic losses. Corn, bean and peanut crops suffer severe attacks from these insects. Therefore, it is necessary to have knowledge of the crop and its main enemies to evaluate the intervention mechanisms and thus be able to protect these crops (Oliveira et al., 2014).

The existence of few local studies involving the characterization and identification of invasive pests of corn, beans and peanut crops led to the formulation of the objective of characterizing and identifying the main invasive insects of corn, beans and peanut crops in an attempt to study viable methods to combat these pests.

2. Methodology

The study was carried out in the Dimuca commune (Figure 1), municipality of Negage, province of Uíge. The municipality is located 37 km northwest of the provincial capital Uíge, which has 27 communities and 82 villages and is home to 159,000 people (De Matos et al., 2021)..

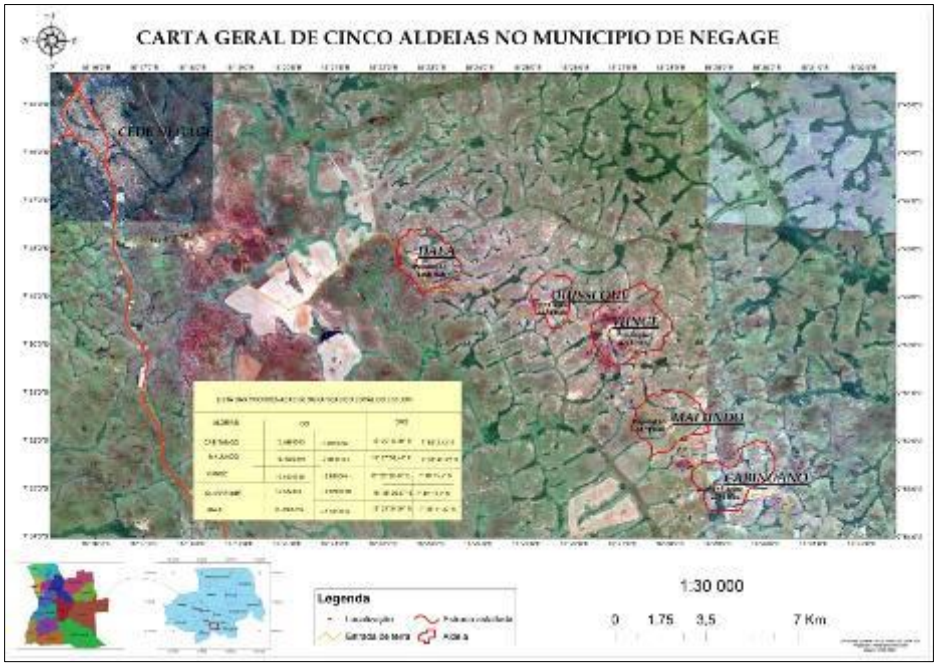

Figure 1 Study area map

2.1. Field research

The field research was carried out between January and June 2023, through interviews based on semi-structured questionnaires, combined with observations, followed by an exploratory phase and a data collection phase.

In the exploratory phase, different production areas were identified, including the choice of the commune to carry out the research, as well as the size of the population to be researched, based on a previous survey carried out by Institute for Agrarian Development (IDA) from the Ministry of Agriculture and Forestry, where the pre-research revealed the lack of data referring to the attacks caused by insect pests on corn, bean and peanut crops, especially in the commune of Dimuca.

For data collection, a total of 402 peasants were covered, distributed across five villages (Figure 1). The research was carried out in the immediate vicinity of the production areas. This phase focused on identifying the different insects that attack the crops, the damage caused to the crops studied and the collection of anthropometric data, such as age, sex and experience of respondents with the crops.

To identify insects in the field, an area of 1m2 was delimited, and the plants within this perimeter were quantified, consequently the number of insects present on each plant on this surface. The insects were subsequently grouped according to their morphology, based on the type of mouthparts and according to the diurnal or nocturnal habits that the insects present.

To identify the insects, images collected in the field were analyzed using the Google Lens® tool, followed by confirmation through specialized bibliography in entomology as described by Rosa, Nanya, & Conte (2011).

The damage was identified through direct observation of the affected parts, through their signs and symptoms, caused by the presence and/or passage of insects as described by (Mampasi, de Carvalho, António, & Munanga, 2024)

2.2. Statistical data analysis

The statistical analysis of the data was performed based on the analysis of variance (ANOVA) using the Statistica 10 software (StatSoft, Tulsa, OK). To determine homogeneous groups, the Tukey test was performed at 95%. Principal Component Analysis (PCA) was performed using XLSTAT software (V 7.0; Addinsoft, Paris, France) to assess the affinity between insects according to their mouthparts and the cultures.

3. Results and Discussion

3.1. Sociodemographic profile of informants

Table 1 presents the sociodemographic profile of bean, corn and peanut producers in the Dimuca Commune. Regarding the gender, the interviewees was mostly female (65%) against 35% of male. The predominance of women can be justified by the fact that they dedicate themselves more time to field cultivation while men are more inclined towards short-term economic activities such as hunting, extraction/production of alcoholic beverages such as *maruvo*, *capuca* and *lunguila*. A study carried out by Mawunu et al., (2023) highlighted the role of women in preserving the ethnobotanical potential of plant resources in the city of Negage, showing a representation of 63% among those surveyed.

Research participants in the study area had an average age of 38 years, with the largest group (54%) being between 35 and 50 years old, followed by informants aged between 20 and 35 years old (35%). The household consisted of an average of 4 to 6 people (46%). It is worth noting that the informants have their families as the workforce to carry out activities in the field, with agricultural production being the main source of income.

Finally, the time that respondents have been engaged in agricultural activity showed that the majority (32%) have been cultivating peanuts, beans and corn for more than 20 years, followed by farmers with 15-20 years of experience (24%), and 10-15 years (19%) (Table 1). The interviewees experience proved to be a useful ally in the preliminary and/or morphological identification of the signs and symptoms caused by insects, as it allowed to observe that the interviewees with more experience showed a greater understanding of the signs presented by the plants in relation to farmers with less time in the activity.

Table 1 Sociodemographic profile of informants

Variables	Parameters	(%) respondents
Gender	Female	65
	Male	35
Age	20-35	38
	35-50	54
	50-65	5
	> 65	3
	1-	19
Household	4-	46
	7-	30
	> 9	5
Years of agricultural experience	1 to 5	11
	5 to 10	14

	10 to 15	19
	15 to20	24
	> 20	32

3.2. Phenological phases most vulnerable to insect attack

Figure 2 illustrates the plant phases the most susceptible to insect attack in peanut, bean and corn crops. The growth phase until harvest was the most attacked for peanut and bean crops with 24%, while for corn crops, the highest attack rate was found in the phases between growth and flowering with 24%. Then, the farmers pointed to the phase between germination and growth as being one of the phases most susceptible to attack, where corn crops have the highest incidence (24%), followed by peanuts (19%) and finally beans (11%). Beans were the crop that suffered the most attacks during the growth phase (19%), followed by corn (11%) and the least attacked was peanuts with 8%.

During the storage period, corn and bean crops were the most attacked cultures (16%) respectively followed by peanut crops (14%). Farmers preserve the seeds in structures locally called *Kimpukas*, where the seeds are stored until the planting period, as mentioned by (Mawunu, 2022).

The period from growth to maturation was one of the least mentioned by farmers in the study area, second only to the sowing period, which was the least attacked phase.

According to Carvalho, Bubans, Jensen, & Barcellos, (2017) in corn crops, the fall armyworm is the pest that causes the most concern to producers, attacking all stages of the crop, especially in the germination and growth phases, as it is at these stages that corn seedlings are small and vulnerable, becoming easy targets due to their soft and succulent foliage.

The susceptibility of corn to insects can vary depending on the variety, climatic conditions, the presence of natural enemies of insects, the adoption of integrated pest management practices and the history of previous infestations in the growing area. Timbó, Menezes, & Lima, (2023), stated that corn is attacked by pests and diseases that occur throughout the development of the crop, from sowing to harvesting. Likewise, highlighted that corn crop pests occur in all producing regions, both in summer crops and in second harvests. They attack the plant from its emergence until the formation of spikes.

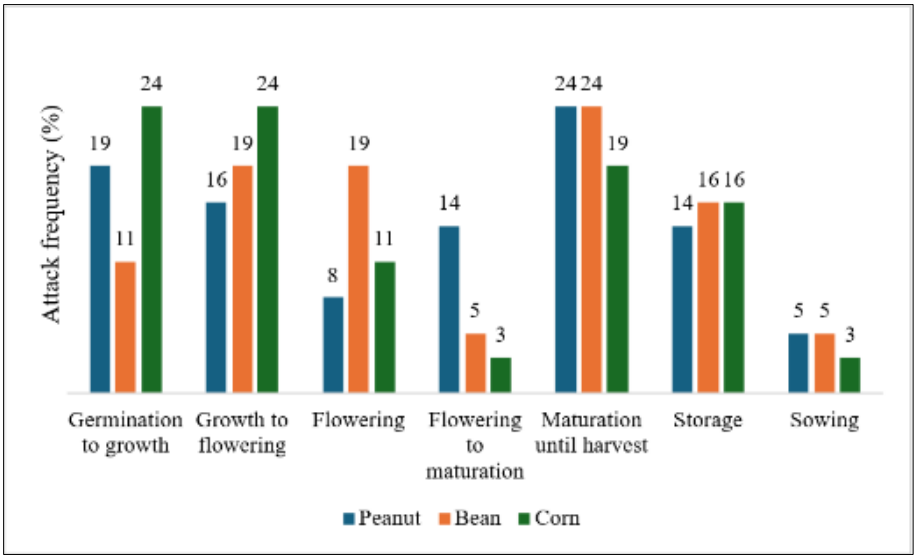

Figure 2 Phenological stages most vulnerable to insect attack in peanut, bean and corn crops (%)

For Singh & Gaur, (2020), pests attack bean crops from emergence to seed storage, arthropods and mollusks can cause significant reductions in bean yield, ranging from 11 to 100%, depending on the species of pest, the cultivar planted and the sowing season. Among the pests that attack beans, whiteflies (*Bemisia* spp.) are the ones that cause the most damage, mainly through the transmission of the Bean Golden Mosaic Virus (BMMV). According to Ouaarous et al., (2025), bean crops are harmed by pest attacks from planting and during the vegetative and reproductive phases of the plant, in addition to the damage caused to stored grains.

For, Santos & Moura, (2017), peanuts attack are naturally susceptible to various insects, mites and microorganisms that can affect, with greater or lesser degrees of severity, the production or quality of the product, in the field, during transport or during storage. The same authors described peanuts as being a crop attacked by more than 360 species of insects in the different parts of the plant, in their different phases of phenological development, where the damage to the crop depends mainly on the intensity of the infestation and the damage caused.

3.3. Ethnoentomological study

The data presented in the

Table 2 provide informations on the infestation of different pest species in three crops (peanuts, beans and corn), analyzed in different neighborhoods (B1 to B5).

The presence of *Euschistus* spp. was recorded in all crops, with greater infestation in corn in B3 (140.00 a), indicating a high vulnerability in this neighborhood for this pest followed by beans equally in B3 (39.00 a), suggesting favorable conditions similar to corn and the infestation was low and uniform in the peanut crop between neighborhoods B4 and B5 (13.33 b, respectively) having maximum values. The presence of *Euschistus* spp. is associated with local factors such as climatic conditions and agricultural practices. In corn and beans, high scores in B3 may indicate less effective management or ideal environmental conditions for the pest. The severity of the attack by *Euschistus* spp. in corn crops can be explained by the fact that the insect pest attacks the crop at all development stage.

The stink bugs *Dichelops melacanthus* and *Dichelops furcatus*, also known as green-bellied stink bugs, inhabit several species of native and exotic plants. These insects traditionally cause damage on corn crops. The incidence of the stink bug *D. melacanthus* is more frequent in lower latitudes, while the species *D. furcatus* occurs mainly in high latitudes (Panizzi & Lucini, 2024).

Phytophagous bugs represent one of the most important groups of insect pests in crops. As they feed directly on the pods, they attack the grains, seriously affecting the yield as well as the physiological and sanitary quality of the seed (Ouaarous et al., 2025).

Rhopalosiphum spp. it is a pest adapted to crops such as beans and peanuts, but less prevalent in corn. *Rhopalosiphum* spp. presented the greatest severity attack, especially in the peanut crop in B4 (176.00 a), standing out as a critical point for this pest and in the bean crop in B3 (170.67 ab), followed by B4 (125.00 ab). In corn, the values were significantly lower, with maximum infestation in B3 (90.00 abcd). The high infestation in B4 and B3 for these crops suggests that these neighborhoods may have a higher host density or agricultural practices that favor the proliferation of the pest.

As explained by Riddick, (2024), the diversity of crops attacked by *Rhopalosiphum* spp. maybe since aphids are polyphagous pests, that is, they attack several families of plants, including *Cucurbitaceae*, *Malvaceae*, *Solanaceae* and *Rutaceae* and are present in regions with tropical, subtropical and temperate climates. These aphids can cause direct damage, such as extracting carbohydrates and amino acids from the phloem of plants, and can indirectly transmit more than 100 species of phytopathogenic viruses, responsible for major losses in agriculture.(Lorenzoni, Rosado, & Soares, 2016)

Table 2 Ethnoentomological study of invasive insects in peanut, bean and corn crops

Culture by location	***Euschistus* spp.**	***Rhopalosiphum* spp.**	***Zonocerus variegatus***	***Schistocerca* spp.**	***Gryllidae* spp.**	***Brachytrupes membranaceus***	***Spodoptera frugiperda***	***Elasmopalpus lignosellus***	***Agrotis ipsilon***	***Bemisia tabaci***
B1-Peanut	6,00 b	13,33 b	13,33 f	13,33 d	86,67 a	86,67 a	-	4,67 a	13,33 a	4,67 a
B2-Peanut	9,00 b	66,67 abc	109,67 a	26,67 d	26,00 b	26,00 b	-	-	19,00 a	-
B3-Peanut	9,00 b	18,67 cd	6,00 f	16,67 d	20,00 b	20,00 b	-	-	10,00 a	-
B4-Peanut	13,33 b	176,00 a	21,00 ef	10,67 d	13,33 b	13,33 b	-	-	20,00 a	-
B5-Peanut	13,33 b	33,33 cd	13,33 d	13,33 d	13,33 b	13,33 b	-	-	16,67 a	-
B1-Beans	18,00 b	106,67 ab	5,33 f	21,33 d	5,33 b	5,33 b	-	-	-	-
B2-Beans	20,75 a	122,67 ab	21,33 de	69,00 c	-	-	-	7,67 a	5,67 a	7,67 a
B3-Beans	39,00 a	170,67 ab	5,33 f	85,33 b	-	-	-	-	-	-
B4-Beans	13,33 b	125,00 ab	5,33 f	12,00 d	-	-	-	3,00 a	37,33 a	3,00 a
B5-Beans	5,33 b	54,67 cd	5,33 f	5,33 f	-	-	-	-	-	-
B1-Corn	15,33 b	9,00 cd	42,00 c	9,00 b	9,00 b	9,00 b	33,00 a	6,33 a	-	6,33 a
B2-Corn	15,00 b	47,99 cd	57,33 d	128,00 a	3,00 b	3,00 b	-	10, 00 a	-	10,00 a
B3-Corn	140,00 a	90,00 abcd	17,33 ef	12,00 b	1,33 b	11,33 b	7,00 bc	3,00 a	-	3,00 a
B4-Corn	67,00 a	69,00 cd	6,00 f	3,00 d	3,00 b	3,00 b	9,00 b	3,00 a	-	3,00 a
B5-Corn	6,00 b	39,00 cd	6,00 f	3,00 d	3,00 b	3,00 b	9,00 b	-	-	-

Zonocerus variegatus showed a higher incidence of attack on peanut crops in B2 (109.67 a), while in the other neighborhoods the incidence was lower. For corn, the attack was more severe in B2 (57.33 d), with lower values in B1 (42.00 c) and B3 (17.33 ef), with lower records in beans. The high presence of *Zonocerus variegatus* in B2 in peanut and corn, suggests that this species finds favorable conditions in this neighborhood, such as abundance of food and ideal climate. According to Bakondongama et al., (2017), when recording a gradual increase in the attack of *Zonocerus variegatus* due to changes in the environment, their numbers increased locally, creating new sources of damage. The authors describe *Zonocerus variegatus* as a heliophilous grasshopper that prefers very humid environments as well as herbaceous and shrubby plants.

It was recorded in all crops, with emphasis on corn, attacked by Schistocerca spp. in B2 (128.00 a), indicating very favorable conditions for this species. In bean crops, the highest incidence was observed in B3 (85.33 b), compared to the attack of this crop in other neighborhoods. In peanuts, the infestation was moderate, with the maximum being in B4 (13.33 d). The presence of Schistocerca spp. may be associated with periods of drought or agricultural practices that favor its reproduction. The high infestation rate in B2 (corn) and B3 (beans) suggests the need for specific interventions in these neighborhoods. This phenomenon is justified by the fact that they are polyphagous species.

According to Bhagarathi & Maharaj, (2023), at least 23 species are considered pests, forty-three species belonging to four families cause economic damage by attacking cultivated plants. The Acrididae family has the largest number of representatives species that constitute regular and serious pests; others are of occasional occurrence, or even of insignificant presence.

The presence of Gryllidae was observed only in peanuts and corn, with a greater infestation in peanuts cultivated in B1 (86.67 a), being statistically similar to the other neighborhoods and in corn crops the maximum population was 9.00 b in B1. Crickets, represented by the family *Gryllidae*, appear to have a preference for peanuts grown in B1, indicating that this crop may be more vulnerable.

This fact is justified by Lim et al., (2023) corroborating the results presented in this study when he described that crickets are insects that live in environments with low vegetation, in native fields or in crops with deficient plant cover. For the author, the cricket causes damage with greater intensity during periods of drought and high nighttime temperatures. For corn and bean crops, attack by *Gryllidae* species occurs with greater severity in the germination phase.

Similar to *Gryllidae*, *Brachytrupes membranaceus* showed the same attack tendency and severity, being more severe in peanut, in B1 (86.67 a). In corn, the infestation was more homogeneous, with maximums in B3 (11.33 b). Like crickets, *B. membranaceus* showed a preference for peanuts in B1, highlighting the importance of targeted management in this neighborhood.

The attack of *Spodoptera frugiperda* was recorded exclusively in corn with maximum infestation in B3 (33.00 a) and absence of attack in B2. The fall armyworm showed high prevalence in B3, being a typical corn pest. The management focus should be on this neighborhood. Carvalho et al., (2017), state that for corn crops, the fall armyworm is the pest that causes the most concern to producers.

In the work carried out by Viana, Guimarães, & Mendes, (2022) it was shown that the fall armyworm has a broad host spectrum, surviving in more than 80 registered plant species, although it has a preference for grasses with an emphasis on corn crops and weedy grasses such as digitada corn (*Digitaria* spp.). The authors also emphasize that when the larvae are numerous, they defoliate their favorite plants, acquire the typical migratory habit of "funnel caterpillars" and disperse in large numbers, consuming almost all the vegetation in their path.

Elasmopalpus lignosellus presented moderate attack and statistically significant difference in all affected crops, with emphasis on corn crop in B2 (10.00 a). In peanuts, only B1 was an attack recorded (4.67 a), for beans, the records were low and homogeneous. The corn borer has a moderate impact, but records suggest greater concern in corn in B2 (10.00 a).

According to Salomão, Ferro, & Ruas, (2020) this insect is a polyphagous pest that attacks more than 60 species of plants, causing serious damage to several economically important crops, such as corn, sugar cane, wheat, soybeans, rice, beans, sorghum, peanuts and cotton, presenting a more severe attack on corn that varies from 20% to total loss of production. The severity of the attack of *Elasmopalpus lignosellus* on corn crops was evidenced by (Farinha & Eugênia, 2010), the caterpillar penetrates the collar region, making galleries inside the stalk, causing the death or tillering of the plant. The

attack causes the destruction of the growth region, when it is below ground level, and totally or partially destroys the merismatic tissues responsible for conducting water and nutrients.

The presence of *Agrotis ipsilon* was recorded only in bean and peanut crops, where it had a low and homogeneous attack with a higher incidence in B4 (37.33 a and 20.00 a, respectively). *Agrotis ipsilon* mainly impacted beans in B4, where control should be a priority. The results observed in bean cultivation corroborate those presented by (Viana et al., 2022). This insect has nocturnal habits and attacks young plants by cutting them close to the ground.

The elasmo caterpillar, as an important pest in corn crops, attacks the youngest plants. Its damage occurs when it is in the larval period, when it is up to 10 cm tall. The losses become greater when there are alternative hosts in the area, such as other crops and/or weeds, which favors the increase in the population in the period prior to planting the crop (Viana et al., 2022).

Elasmopalpus lignosellus and *Bemisia tabaci* presented the same attack pattern, being moderate and statistically similar in all affected crops, with emphasis on the corn crop in B2 (10.00 a). In peanuts, only B1 was an attack recorded (4.67 a). For beans, the records were low and homogeneous, both for *E. lignosellus* and for *B. tabaci*. The corn borer (*E. lignosellus*) had a moderate impact, but records suggest greater concern in B2 corn (10.00 a). While whitefly had limited impact, its presence in peanuts indicates the need for monitoring.

The results corroborate what was described by Silva et al., (2017), which showed that beans and snap beans are the most common host species for *Bemisia tabaci* attacks. This specie uses its stylets to suck phloem sap from plant stems and leaves. Large populations of whiteflies cause yellowing, drying, distortion, discoloration or leaf drop (Ouguas & Azenzem, 2025).

3.4. Analysis of the affinity of insect pests with crops

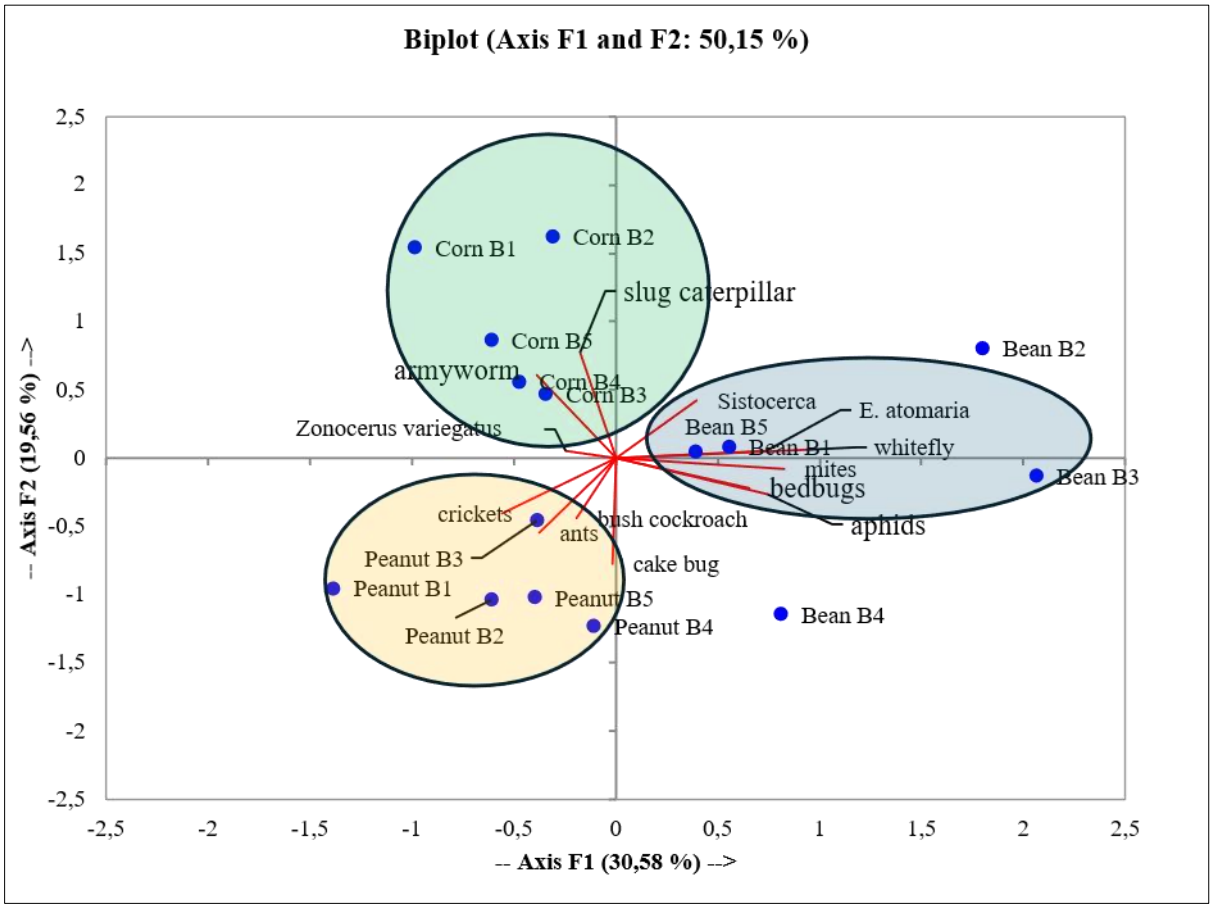

Figure 3 Análise de Componentes Principais. The letter B represents the different locations studied

Principal Component Analysis allowed us to observe, on one hand, the affinity of insects with crops and, on the other hand, the distribution of these insects in the different areas where the study was carried out (figure 3). Where the crops and their respective locations are represented by the blue dots and the red lines indicate the identified insects.

It was thus possible to observe that insects with sucking mouthparts, such as whiteflies, aphids and bedbugs, were mainly related to bean crops. Insects with chewing mouthparts such as fall armyworm, slug caterpillar and *Zonocerus variegatus* mainly attacked corn crops, while insects such as *Brachytrupes membranaceus*, *Blatteae* Spp and *Formicidae* sp had greater affinity with peanut crops. Our results corroborate studies carried out by (Asif, Rayamajhi, & Mahmud, 2025; Nogueira et al., 2016; Spatt, Sturza, & Dequech, 2011; Santos & Moura, 2017; Picanço, 2010).

3.5. Crop organs attacked by insects

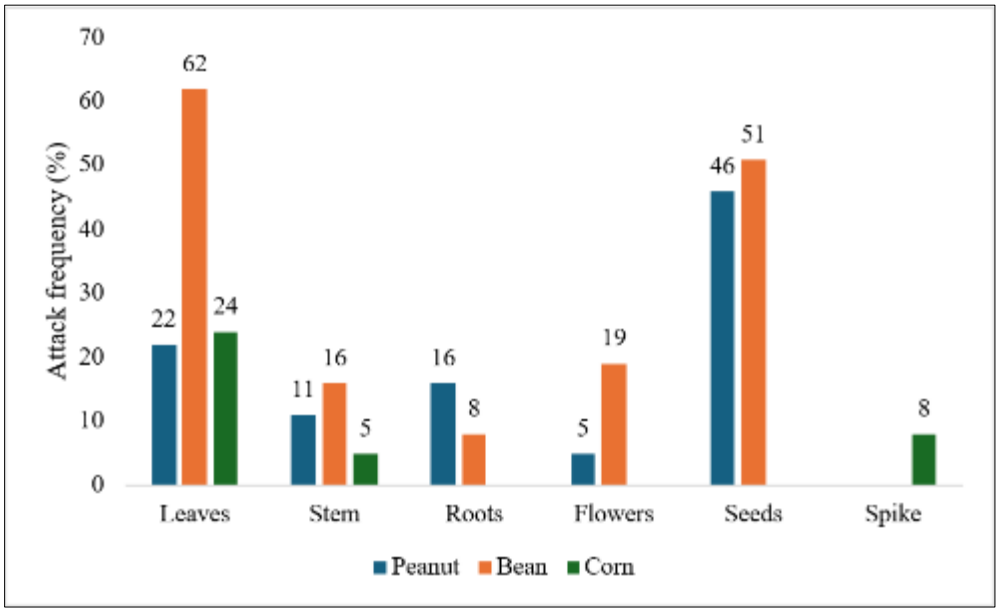

Figure 4 Attack of plant organs by insects

Figure 4 shows the results regarding the attack of plant parts. According to the illustration, the bean crop was the most attacked among the others, with emphasis on leaves, seeds and flowers (62, 51 and 19 frequencies, respectively), except in the root where the peanut presented the highest attack rate. Next, the most attacked crop was peanuts, whose most attacked organ is the seeds.

The higher incidence of attack on peanut seeds was due to the fact that they have a geocarpic fruit, thus better attracting *Formidae* spp. And *Brachytrupes membranaceus*, because their habitat is the soil, where the peanut seed develops and matures. Compared to the others, the corn crop showed low attacks on the different organs of the plant.

In the study carried out by Letting, Venkataramana, & Ndakidemi, (2021) it was highlighted that insect pests consume reserve tissues and the embryo, determining the loss of dry matter essential for vital activities and, as a consequence, loss of weight, physical purity and physiological quality of the seeds is observed., Attacks on roots may be associated with the adoption of direct planting, which generally results in an increase in insects attacking the root system of plants.

3.6. Pest control in crops

Peanut, bean and corn producers in the Dimuca Commune do not use phytopharmaceuticals to prevent or control pests and diseases. When asked Regarding the reason for not using phytopharmaceuticals, they indicated the unavailability and/or lack of knowledge about the use of these products and as a solution they resort to alternative sources to combat and control insect pests in these crops.

The results of the research related to pest control allowed us to observe that 21.6% of producers in the studied location, combat pests using rudimentary techniques such as the use of ash and plants with biopesticide properties. 78.4% of informants do not combat insect pests for two reasons: 67.6% because they do not have the technical knowledge to apply the products and 10.8% do not combat them due to the unavailability of the product.

The lack of technical knowledge in the application of insecticides by respondents is related to their low level of technical knowledge, which hinders their ability to diagnose the insects that cause economic damage to crops.

As stated by Guimarães, (2023) the control of pests or diseases in any crop is justified for economic reasons, since, as recommended by good integrated pest management practices, an organism is only considered a pest when it causes economic damage. On the other hand, the lack of knowledge on the use of insecticides associated with the low level of education of farmers can be detrimental to the understanding the information presented on the packaging of chemical products, which can interfere with the dosage and preparation of the pesticide.

Farmers in the Dimuca Commune who combat invasive insects, 39% use ash against aphids, 23% use extracts of *Ricinnus communis* L. to combat locusts, 18% combat whiteflies using tobacco, 11% use soil to combat fall armyworm, and 9% use pepper to combat various pests. According to Barros (2017), to reduce the incidence of pest species, some plant extracts with insecticidal power have been used, as well as crop rotation.

For Spletozer, Santos, Sanches, & Garlet, (2021), several plant extracts have insecticidal properties against stem borers infesting cereals in Africa. These include margosa (*Azadirachta indica*), acacia (*Acacia* sp.), tephrosia (*Tephrosia vogelii*), West African pepper (*Piper guineense*), chili pepper (*Capsicum* sp.), onion (*Allium sativum*, *Allium cepa*), lemongrass (*Cymbopogon citratus*), tobacco (*Nicotiana tabacum*), and wild sunflower (*Tithonia diversifolia*).

3.7. Economic impact of insects.

Insects play a crucial role in seed dispersal, maintaining soil structure and fertility, and controlling the population of other living beings (including predators, parasites, parasitoids, vectors and disease agents). Additionally, insects play a crucial role as pollinators. Natural and controlled pollinators have a deep connection with human well-being, due to their crucial role in the reproduction of wild plants and in agricultural production, impacting the yield of approximately 75% of the most relevant crops globally (Belluco et al., 2023).

The most direct economic impact of pests is the reduction or loss of crop production which results in a reduction in agricultural yield. Pest infestations can compromise fertilization or germination rates. Production losses caused by pests, although seemingly easy to identify, can be difficult to measure in economic terms (Makgoba, Tshikhudo, Nnzeru, & Makhado, 2021).

4. Conclusion

The study allowed us to identify the insects that most attack peanut, bean and corn crops in the Dimuca Commune, which belong to the species *Formicidae* spp., *Brachytrupes membranaceus*, *Agrotis ípsilon*, *Euschistus* spp., *Rhopalosiphum* spp., *Schistocerca* spp., *Spodoptera frugiperda*, *Bemisia tabaci*, *Euschistus* spp., *Diabrotica speciosa* and *Elasmopalpus lignosellus*. These species cause damage to all plant organs and at all stages of growth and development, with greater severity during the growth and harvest phase. It was noted that the damage caused by each insect pest was not proportional in all the studied neighborhoods of the Dimuca Commune.

There was a higher incidence of peanut crops attacked by *Formicidae* spp., respectively in neighborhoods B1 and B2. The attack by *Spodoptera frugiperda* was identified only in the corn crop in 4 of the 5 studied neighborhoods, where the attack was more severe in B1 compared to the others. For *Bemisia tabaci*, the most severe attack was recorded in B2 and B3 in bean crops. *Euschistus* spp. attacked all crops in all neighborhoods, with emphasis on B3 and B4 in corn crops and less severe in B1, B2 and B5.

The PCA resulted in the grouping of three types of insect pests according to their mouthparts, where insects with sucking mouthparts were mainly related to bean crops, insects with chewing mouthparts mainly attacked corn crops, while insects such as crickets, cockroaches and ants had a greater affinity with peanut crops.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

References

[1] ACDI. (2016). Study undertaken in support of the International Fund for Agricultural Development SADeP project in Angola [Summary report and Recommendations]. Angola: University of cape town.

[2] Asif, M., Rayamajhi, A., & Mahmud, M. S. (2025). Technological Progress Toward Peanut Disease Management: A Review. Sensors, 25(4), 1255. Obtido de https://www.mdpi.com/1424-8220/25/4/1255.

[3] Bakondongama, B., Mubenga, K., Mondivudri, A., Ngabu, C., Mpiana, P. T., Kosele, K., & Juakaly, M. (2017). Zonocerus variegatus (Linné 1758, Orthoptera: Pyrgomorphidae) et ses parasitoïdes (Hyménoptères) dans la ville de Kisangani, RDC. 32(1), 64–74.

[4] Barros, J. F. C. (2017). Rotações de Culturas e Afolhamentos. Em Texto de apoio para as Unidades Curriculares de Sistemas e Tecnologias Agropecuários, Tecnologia do Solo e das Culturas, Noções Básicas de Agricultura e Fundamentos de Agricultura Geral (Vol. 1, p. 73). Évora 2.

[5] Belluco, S., Bertola, M., Montarsi, F., Di Martino, G., Granato, A., Stella, R., … Mutinelli, F. (2023). Insects and Public Health: An Overview. Insects, 14(3), 240. https://doi.org/10.3390/insects14030240.

[6] Bhagarathi, L. K., & Maharaj, G. (2023). Impact of climate change on insect biology, ecology, population dynamics, and pest management: A critical review. World Journal of Advanced Research and Reviews, 19(3), 541–568. Obtido de https://wjarr.co.in/wjarr-2023-1843.

[7] Carvalho, N. L. D., Bubans, V. E., Jensen, L., & Barcellos, A. L. D. (2017). Milho: Aspectos gerais da cultura e manejo integrado de pragas1 corn: General aspects of culture and integrated management of pests. Salao de Conhecimento, 12.

[8] De Matos, D., Martins, A. C., Senna-Martinez, J. C., Pinto, I., Coelho, A. G., Ferreira, S. S., & Oosterbeek, L. (2021). Review of Archaeological Research in Angola. African Archaeological Review, 38(2), 319–344. https://doi.org/10.1007/s10437-020-09420-8.

[9] De Melo, E. B., Barros, L. N., Souza, L. K. R., de Oliveira Melo, L., Gonçalves, R. M. O., & Borges, D. C. S. (2021). A importância da agricultura para a sociedade: Breve revisão de literatura. Scientia Generalis, 2(Supl. 1), 144–144. Obtido de http://scientiageneralis.com.br/index.php/SG/article/view/362.

[10] Farinha, & Eugênia, A. (2010). Insectos Sugadores Pragas Das Plantas Ornamentais. 5. (in Portuguese).

[11] Guimarães, F. B. (2023). Uso de derivativos agropecuários: Contratos de opções na gestão de riscos e proteção de preços das commodities (boi gordo, milho e soja) negociados por produtores goianos de Rio Verde. Obtido de https://repositorio.idp.edu.br/handle/123456789/4952. (in Portuguese).

[12] Khan, N., Fahad, S., Naushad, M., & Faisal, S. (2020). Grape production critical review in the world. Available at SSRN 3595842. Obtido de https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3632100.

[13] Letting, F. K., Venkataramana, P. B., & Ndakidemi, P. A. (2021). Breeding potential of lablab [Lablab purpureus (L.) Sweet]: A review on characterization and bruchid studies towards improved production and utilization in Africa. Genetic Resources and Crop Evolution, 68(8), 3081–3101. https://doi.org/10.1007/s10722-021-01271-9.

[14] Lim, J. A., Yaacob, J. S., Mohd Rasli, S. R. A., Eyahmalay, J. E., El Enshasy, H. A., & Zakaria, M. R. S. (2023). Mitigating the repercussions of climate change on diseases affecting important crop commodities in Southeast Asia, for food security and environmental sustainability—A review. Frontiers in Sustainable Food Systems, 6, 1030540. Obtido de https://www.frontiersin.org/articles/10.3389/fsufs.2022.1030540/full.

[15] Lorenzoni, R. M., Rosado, C. C. G., & Soares, T. C. B. (2016). Diversidade Genética em Espécies Do Gênero Annona L. (Annonaceae). Tópicos Especiais em Produção Vegetal VI, 145. Obtido de https://www.researchgate.net/profile/Paula-Mauri-Bernardes/publication/328677040_Passifloras_do_Espirito_Santo_usos_e_potenciais/links/5bdb8533a6fdcc3a8db77d65/Passifloras-do-Espirito-Santo-usos-e-potenciais.pdf#page=146.

[16] Makgoba, M. C., Tshikhudo, P. P., Nnzeru, L. R., & Makhado, R. A. (2021). Impact of fall armyworm (Spodoptera frugiperda) (J.E. Smith) on small-scale maize farmers and its control strategies in the Limpopo province, South Africa. Jàmbá Journal of Disaster Risk Studies, 13(1). https://doi.org/10.4102/jamba.v13i1.1016.

[17] Mampasi, N., de Carvalho, M., António, M., & Munanga, B. (2024). Survey and Identification of Main Pests and Pest Management in Cassava Crop in Uíge Municipality, Angola. 1(1), 8.

[18] Mawunu, M. (2022). Biodiversity and Ethnobotany of Medicinal Plants of the Small Songo City, Angola. Journal of Quality in Health Care & Economics, 5(4), 1–24. https://doi.org/10.23880/jqhe-16000290.

[19] Mawunu, M., António, D., Vita, P., Ngbolua, K.-T.-N., Luyeye, L., Ndiku, L., … Francisco, N. M. (2023). Ethnobotanical Survey of Herbal Teas Consumed in Uíge Province, Angola: Part 1. Ethnobotany Research and Applications, 26. https://doi.org/10.32859/era.26.23.1-27.

[20] Nogueira, L., Jesus, F. G. D., Almeida, A. C. D. S., Bioça Junior, A. L., Godoy, I. J. D., & Corrêa, F. (2016). Caracterização de cultivares de amendoim quanto ao dano de Stegasta bosquella (Chambers, 1875) (Lepidoptera: Gelechiidae). Arquivos do Instituto Biológico, 83(0). https://doi.org/10.1590/1808-1657001012013.

[21] Oliveira, A. B., Barata, A., Prates, A., Mendes, F., Bento, F., Gaspar, L., & Cavaco, M. (2014). Proteção Integrada das Culturas. Lisboa. (in Portuguese).

[22] Ouaarous, M., El Fakhouri, K., Taarji, N., Baouchi, A., Amri, M., Ramdani, C., … El Bouhssini, M. (2025). Impact of Field Insect Pests on Seed and Nutritional Quality of Some Important Crops: A Comprehensive Review. ACS Omega, 10(9), 8779–8792. https://doi.org/10.1021/acsomega.4c08982.

[23] Ouguas, Y., & Azenzem, R. (2025). Ravageurs et Maladies du Câprier: Risques, Gestion et Perspectives pour une Culture Durable au Maroc. African and Mediterranean Agricultural Journal-Al Awamia, (146), 101–117. Obtido de https://revues.imist.ma/index.php/Afrimed/article/view/51128.

[24] Panizzi, A. R., & Lucini, T. (2024). Life history studies of stink bugs: Much-needed research to support their conservation biological control. BioControl, 69(5), 493–505. https://doi.org/10.1007/s10526-023-10214-5.

[25] Picanço, M. C. (2010). Manejo integrado de pragas. Universidade Federal de Viçosa: VIÇOSA - MG. (in Portuguese).

[26] Riddick, E. W. (2024). Evaluating the Effects of Flavonoids on Insects: Implications for Managing Pests Without Harming Beneficials. Insects, 15(12), 956. Obtido de https://www.mdpi.com/2075-4450/15/12/956.

[27] Rosa, A. P., Nanya, S., & Conte, H. (2011). Entomofauna associada à cultura de uva (Vitis spp.) no município de marialva-P. Artigo Periodico, (ISBN 978-85-8084-055-1).

[28] Salomão, P. E. A., Ferro, A. M. S., & Ruas, W. F. (2020). Herbicidas no Brasil: Um breve revisão. Research, Society and Development, 9(2), e32921990–e32921990. Obtido de https://rsdjournal.org/index.php/rsd/article/view/1990.

[29] Santos, R. S., & Moura, L. D. A. (2017). Entomofauna associada ao amendoinzeiro em rio branco, ACRE, BRASIL. Agrotrópica (Itabuna), 29(2), 167–172. https://doi.org/10.21757/0103-3816.2017v29n2p167-172.

[30] Silva, A. F., & Neto, A. R. (2019). As Principais Culturas anuais e bianuais na Agricultura Familiar. Em Culturais Anuais e bianuais na Agricultura Famiar (p. 40). Lagoa do Cvalos: Semiarido.

[31] Silva, A. G. D., Boiça Junior, A. L., Souza, B. H. S. D., Costa, E. N., Hoelhert, J. D. S., Almeida, A. M., & Dos Santos, L. B. (2017). Mosca-Branca, Bemisia tabaci (Genn.) (Hemiptera: Aleyrodidae) em feijoeiro: Características gerais, bioecologia e métodos de controle. EntomoBrasilis, 10(1), 01–08. https://doi.org/10.12741/ebrasilis.v10i1.616.

[32] Singh, S. K., & Gaur, S. S. (2020). Corporate growth, sustainability and business ethics in twenty-first century. Journal of Management and Governance, 24(2), 303–305. https://doi.org/10.1007/s10997-020-09512-2.

[33] Spatt, L. L., Sturza, V. S., & Dequech, S. T. B. (2011). Danos Da Lagarta-Do-Cartucho Em Milho “Safrinha” (N.o 2; p. 4). Lisboa: Universidade Federal Santa Maria.

[34] Spletozer, A. G., Santos, C. R. D., Sanches, L. A., & Garlet, J. (2021). Plantas com potencial inseticida: Enfoque em espécies amazônicas. Ciência Florestal, 31(2), 974–997. https://doi.org/10.5902/1980509832244.

[35] Timbó, F. V. A. M., Menezes, T. A., & Lima, R. P. (2023). Principais Pragas Que Afetam a Cultura Do Milho. Revista Foco, 16(10), e3460. https://doi.org/10.54751/revistafoco.v16n10-187.

[36] Viana, P. A., Guimarães, P. E. de O., & Mendes, S. M. (2022). Maize Cultivars With Native Insect Resistance–Potential, Advances, And Challenges. Revista Brasileira de Milho e Sorgo, 21. Obtido de https://rbms.abms.org.br/index.php/ojs/article/view/1250