Analysis of Preservative Methods Used in the Storage of Cowpea Grain by Farmers and Marketers in Hong Local Government Area, Adamawa State, Nigeria

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ABSTRACT

The study analyzed the preservative methods used in the storage of cowpea grain by farmers and marketers in Hong Local Government Area, Adamawa State, Nigeria. The study aimed to identify the types of chemicals used in preservation of cowpea by the respondents, compare the shelf life of cowpea grains using different method of storage, ascertain the effects of each measure on human health, identify the most effective measure of storage and the constraints associated with each of the method used as a treatment. Experimental and survey research design was used for the study. The former involves practical experimentation with chemicals / method used in the storage of cowpea which required Randomized Complete Block Design (RBCD) of 5x5 which will serve as Replication 1 and 2, while the later will make use of questionnaire to achieve objectives I, III and IV. The data obtained were analyzed using descriptive statistics and graph. The result unveiled that most of the farmers and marketers (88%) in the study area make used of aluminum phosphide in storing beans grain. It was found that cowpea grains stored using pics sac (125kg), pepper (124kg), Dichlorophous (124kg), permethrin (125kg), aluminum phosphide (125kg), jerry can (125kg) and drum (125kg) were of tremendously aid in the control of insect infestation as the weight of the grains stored did not loss. The use of chemicals in storing of cowpea grain have negative effect on human health. The most effective means for storing grains include pics sac, pepper, jerry can and drum as the maintain both the quality and quantity of cowpea grains. The constraints associated with the method used in storing cowpea grains include most of the device requires air tight that is anaerobic condition in the vacuum which one have to be vigilant. not suitable for large storage, time consuming and pics sac might be damage by rodents. The study recommends that there is need for public enlighten campaign on the health hazard of chemicals used in the storing of cowpea grains through National Orientation Agency and both governmental and non-governmental organizations should assist in assist in the provision of some of the storage devices that cannot make use of chemical as preventive.

Keywords: Preservative, Methods, Storage, Cowpea grain, Farmers and Marketers.

INTRODUCTION

Background of the Study

Grains are seeds from grasses called cereals that were first cultivated over nine thousand years ago. Among the first to be cultivated were wheat and barley in the Middle East, rice and millet in Asia and Africa, and corn or maize in Central America. All these grains are still eaten today, along with many others like oats, rye and sorghum. Many grains are cooked and eaten whole or made into breakfast cereals. But grains like wheat, rye, millet and corn are usually ground into a powder called flour which is then used to make foods like bread, cakes and tortillas. Like grains, Cowpea are edible seeds, but are usually bigger than grains and come from flowering plants instead of grasses. They have been cultivated for thousands of years in all parts of the world. Broad Cowpea, mung Cowpea and adzuki Cowpea were first cultivated in Asia, while lima Cowpea, pinto Cowpea, kidney Cowpea and haricot Cowpea (now used to make "baked Cowpea") were first cultivated in South America.

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The cocoa bean, from which chocolate is made, is also from South America, while Africa's most famous bean by far is the coffee bean (Cristine *et al,*. 2023).

Insect infestation causes considerable loss due to the tunnelling activity of the larvae in the seed. It has been estimated that the loss in weight of a seed of cowpea due to a single larva of Callosobruchus maculatus (a common pest of cowpeas) can be between 3.39 and 5.465% (Brooker, 2019). In Nigeria Caswell (2020) stated that about 5500 tons/year of a one million ton harvest of cowpeas (5.5%) are consumed by bruchids. Giles (2019) reported that comprehensive and reliable information concerning the quantity of losses caused by insects can only be obtained from well-designed surveys involving the measurement of losses using proven methods of loss assessment

They are edible seeds of various plants in the Poaceae (Gramineae) family, which is one of the flowering plants whose stems have internodes. Such as, rice, wheat, corn, and so on. Grains are divided into two types, namely true cereals and pseudocereals. True cereals are types of grains that come from the Poaceae family, for example rice, wheat, oats, corn, barley, rye, sorghum, and millet. While pseudocereals are types of grains that are not from the poaceae family, for example quinoa, buckwheat, and amaranth. Based on processing, grains are divided into two types, namely whole grains and refined grains, what's the difference. To this end the study intend to analyze the preservative method used in the storage of Cowpea grain by farmers and marketers in Hong Local Government Area, Adamawa State, Nigeria.

Efficient post-harvest handling storage can tremendously contribute to socio-economic empowerment in developing nations. Farmers use traditional storage containers for storing food grains for their own need. These storage structures are comparatively cheap, eco-friendly and impart high shelf life to the stored commodities. These traditional storage systems could be applied in modern storage areas with minor modification, could save food commodities that would be damaged by insects. Although chemical methods of management of stored produce pests are highly successful, they leave behind toxic residues. The traditional wisdom and methods of storage can protect commodities from insect infestation for substantially longer periods (Adesina *et el.,* 2019). Abudulai *et al.* 2014; Aboagye *et al.* 2017; Manandhar et al. 2018., Sugri *et al.* 2021; Bidzakin *et al.* 2022 studied on cowpea grains storage and found that storage is a positive step towards food security, especially in periods in the year where production is low and there are various improved grain storage methods including the use of synthetic chemicals, although they are associated with other problems such as residual effects in the products. As a result, different ecofriendly methods have been used with mixed results

With the available studies, unfortunately there have been few good studies of the over-all losses caused by insects in stored cowpea graoins and none of such have been carry out on comparing cowpea grain storage in the intend study area and farmers do sell their product mostly during harvest time and the price is generally low. Thus, there is need to compare the different cowpea grain storage methods as well as the most preferable product after storage b the consumers. The aim of the study is to analyze the preservative methods used in the storage of Cowpea grain by farmers and marketers in Hong Local Government Area, Adamawa State, Nigeria. To achieve this aim, the following objectives are set:-

i. Identify the types of chemicals used in preservation of cowpea by the respondents.,

ii. Compare the shelf life of Cowpea grains using different method of storage.,

iii. Ascertain the effects of each measure on human health.,

iv. Identify the most effective measure of storage and

v. Identify the constraints associated with each of the method used as a treatment

Experimental Site

The experimental site was located in Hong Local Government Area, Adamawa State, Nigeria.

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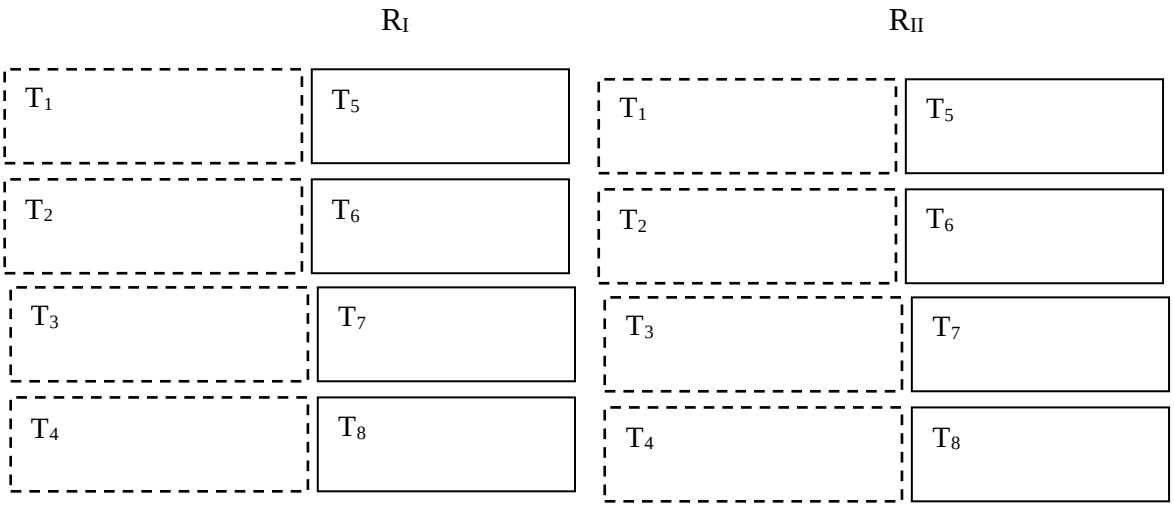
Research Design

Experimental and survey research design was used for the study. The former involves practical experimentation with chemicals / method used in the storage of Cowpea whic required Randomized Complete Block Design (RBCD) of 5x5 which will serve as Replication 1 and 2, while the later will make use of questionnaire to achieve objectives I, III and IV.



T_1 = Dichlorophous

T_2= PICS Sac

T_3 = Rhombus

T_4 = Permethrin

T_5 = Pepper

T_6 = Aluminum phosphide

T_7 = Jerry can

T_8 = Drum

Figure 1 Experimental Design

Experimental Materials

Materials	**Quantity**
i. Cowpea grain	1000Kg
ii. Pics sac	60 pieces
iii. Pepper	15 measures
iv. Drum	16 pieces
i. Rhombus	4
ii. Jeri can	16 pieces
vi. Aluminum phosphide	10 packets

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vii. Hand glove/ facemasks	30 pieces
viii. Permethrin	30 pieces
ix. Dichlorophous	10 litres
x. Makers for labeling	10 pieces
xi. Record book	4 pieces

Method of Data Collection

The data were collected using weighing balance and physical observation of the grains as well as questionnaire though personal interview may be incorporated when the need arises. The experimental one was rely on the data collected on the quantity and quality of Cowpea grains under treatments as well as acceptability for consumption by human being. The quantity of cowpea grains were measured using weighing balance by taking the weight of the grains after storage for the 8 months. Also, from the population of cowpea farmers and marketer in the study area 300 farmers were proportionately sample which served as sample size so as to achieve objective I, III, IV.

Method of Data Analysis

The data were analyze using descriptive statistics and chart.

RESULTS AND DISCSSION

Types of chemicals used in preservation of cowpea by the respondents

In Table 1, it shown the types of chemicals used in preservation of cowpea by the respondents in the study area. It was pointed out by most (88%) of the respondents disclosed that the make used of aluminum phosphide and less number of the respondents used of Permethrin and Dichlorophous as represented by 29% and 26% respectively. This implies that most of the farmers and marketers in the study area make used of aluminum phosphide in storing beans grain. This is collaborate with the study of Cristine *et al.* (2023) who found that farmers made use of different measures in storage of cowpea grain.

Table 1: Types of chemicals used in preservation of cowpea in the study area

Types of chemicals	***Frequency**	**Percentage**
Permethrin	88	29
Dichlorophous	77	26
Aluminum phosphide	267	88
Total	**432**	

***Multiple responses

Source: Field survey, 2025

Compare the shelf life of Cowpea grains using different method of storage

The longevity of cowpea grains stored using different methods/preventive was shown in Figure 2. The weight of the grains was weighed using weighing balance for the treatments under trial for 8 months. It was found that the grains stored using pics sac, pepper, Dichlorophous, permethrin, aluminum phosphide, jerry can and drum were of tremendously aid in the control of insect infestation as the weight of the grains stored did not loss. But

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with the rhombus, the quantity reduces drastically. The none reduction of weight of grains in the device and the measures were due to anaerobic condition and the chemicals kills any of the insects that will invade into the stored grains. This corresponds with the findings of Adesina *et al.* (2019).

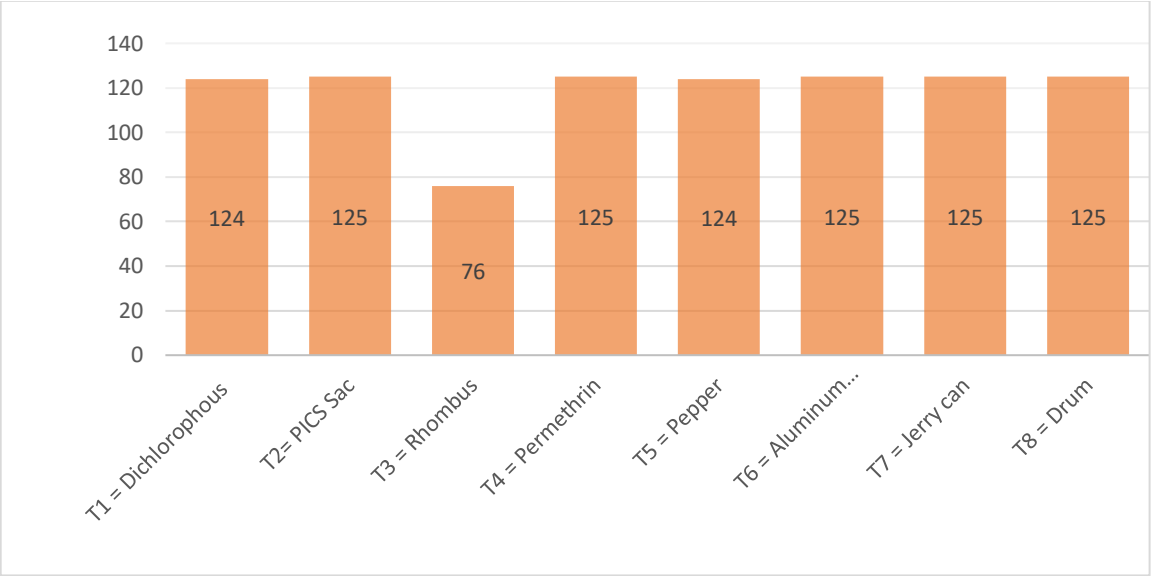

Figure 2: Weight of cowpea grains (in Kilogram) of different storage/Preventive methods

Effects of each measure on human health

Table 2 shows the results on the effects of each measure on human health used in preservation of cowpea by the respondents in the study area. It was pointed out by predominant (85%) of the respondents pointed out that used of permethrin in storing cowpea grains bring about stomach upset, used of Dichlorophous lead to health hazardous (71%) and aluminum phosphide can kill individual (92%). This signifies that used of chemicals in storing of cowpea grain have negative effect on human health. This is in line with the study of Samuel *et al.* (2024).

Table 2: Effects of using different measures in storing cowpea grains on human health

Measures	**Health issue (s)**	***Frequency**	**Percentage**
Permethrin	It bring about stomach upset	254	85
Dichlorophous	It is hazardous to health	213	71
Aluminum phosphide	It can kill individual	276	92

Source: * Multiple responses

The most effective measure of storage

In Figure 2, it can be deduced that the most effective means for storing grains include pics sac, pepper, jerry can and drum as the maintain both the quality and quantity of cowpea grains as use of chemicals in storing of cowpea grain have negative effect on human health.

Constraints associated with methods of storing cowpea grains

The constraints associated with each of the method used in storing cowpea grains were tabulated in Table 4 below obtained through verbal interview. The results show that most of the device requires air tight that is anaerobic condition in the vacuum which one have to be vigilant. not suitable for large storage, time consuming and pics sac might be damage by rodents.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue IV April 2025

Table 4: Constraints associated with each of the method used as a treatment

Method (s) of storage	Constraints
Drum	1. It requires to be air tight that is anaerobic condition in the vacuum which one have to be vigilant
	2. Not suitable for large storage
	3. It is time consuming
	4. Drum is expensive compare to some storage
Rhombus	1. Might be dwelling place for rodent that attack stored grains
	2. It is not air tight hence harbor insect attack
	3. It requires regular inspection of the stored grains
Jeri can	1. It requires to be air tight that is anaerobic condition in the vacuum which one have to be vigilant
	2. It is time consuming
	3. Not suitable for large storage of grains
Pics sac	1. It requires regular inspection of the stored grains
	2. The sac might be damage by rodents
	3. The opening should be air tight that is kept under anaerobic condition in the vacuum which one have to be vigilant

CONCLUSION

Insect infestation causes considerable loss due to the tunnelling activity of the larvae in the seed. It has been estimated that the loss in weight of a seed of cowpea due to a single larva of Callosobruchus maculatus (a common pest of cowpeas). Efficient post-harvest handling storage can tremendously contribute to socio-economic empowerment in developing nations. The result unveiled that most of the farmers and marketers in the study area make used of aluminum phosphide in storing beans grain. It was found that the grains stored using pics sac (125kg), pepper (124kg), Dichlorophous (124kg), permethrin (125kg), aluminum phosphide (125kg), jerry can (125kg) and drum (125kg) were of tremendously aid in the control of insect infestation as the weight of the grains stored did not loss. The use of chemicals in storing of cowpea grain have negative effect on human health. The most effective means for storing grains include pics sac, pepper, jerry can and drum as the maintain both the quality and quantity of cowpea grains. The constraints associated with the method used in storing cowpea grains include most of the device requires air tight that is anaerobic condition in the vacuum which one have to be vigilant. not suitable for large storage, time consuming and pics sac might be damage by rodents.

RECOMMENDATIONS

with the outcome of the findings, the study recommend the following:-

i. There is need for public enlighten campaign on the health hazard of chemicals used in the storing of cowpea grains through National Orientation Agency.

ii. Both governmental and non-governmental organizations should assist in assist in the provision of some of the storage devices that cannot make use of chemical as preventive.

ISSN No. 2454-6194 | DOI: 10.51584/IJRIAS |Volume X Issue IV April 2025

iii. There is also need to trained farmers and marketers on how to make used of some of the storage device that are effective so as achieved the desired goals that high profit from the venture through well trained extension agents.

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