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Research Article

Assessment of Cultural Practices and Farmers, Knowledge of Causes and Prevention of Storage Losses of White Yams (*Dioscorea rotundata)* in three Producing Communities of Benue State, Nigeria

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Abstract

A survey was conducted in three yam producing communities from the three Senatorial Zones of Benue state, Nigeria, to assess the cultural practices adopted by farmers. Data obtained using a structured questionnaire and oral interviews were subjected to simple statistical analysis and interpretation. It was discovered that most farmers use herbicides for land clearing and control of weeds. Majority of farmers plant yams on heaps. Several local varieties are cultivated but farmers rate some higher than others in terms of harvest size and prices they attract. Hembakwase, Faketsa and Ogoja varieties top the rating in Zones A and B while Ojibo, Okpondo and Ogede are highly valued in Zone C. Farmers use mostly NPK fertilizer (78-84%) but others use Urea (5-20%) or a combination of the two brands (3-6%). Majority of farmers store harvested yams in grass huts (52 -68%). Fewer farmers store theirs in zinc houses (26-45%) or in covered heaps under shade (3-6%). Storage losses of between 1 -30% are suffered by farmers. Farmers attribute such losses to decay caused by heat (36-40%), pests/rodents (6-26%), poor ventilation (7-12%), cuts/injuries (4-19%) and chemicals/fertilizer application (3-34%). They suggest storage in cool and airy places, avoidance of injuries, protection from rodents and regular checking as measures to control such losses.

Keywords: Cultural Practices, Pesticides, Storage Methods, Postharvest Losses

Introduction

Yams (Dioscorea spp) are climbing monocotyledonous vines that produce underground tubers. The plant produces tubers and bulbils, which are edible and have economic importance [1]. They are of major importance in the diets and economic welfare of people in West Africa, Caribbean island, Asia and Oceania and are estimated to provide more than 200 dietary calories each day for over 60 million people [2, 3, 4]. Yams are the second most important tuber crop in the whole world after cassava, in terms of production [5]. Over 600 species of yam (out of which only few are cultivated for food) have been reported [6]. The economically cultivated yam species are white yam (*Dioscorea rotundata Poir),* water yam (*D. alata*), bitter yam (*D. dumetorum*), and yellow yam (*D. cayenesis*) [7]. Although yam is produced in many parts of the world including Asia, Latin American and Caribbean countries like Colombia, Brazil, Haiti, Cuba and

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Jamaica, and in some parts of North Africa such as Ethiopia, West Africa is the sub-region of concentration of its production [5]. In West Africa, yam is one of the principal food crops produced in the sub-humid agro-ecologies which corresponds to the middle zones of the coastal countries of the sub-region from Nigeria to Cote d'Ivoire, the so called yam belt of the world. North of that zone, yam production pales to marginal scale in non-humid agro-ecological zone. Nigeria is the world's largest producer of yams followed by Ghana, Cote d'Ivoire, Benin, Togo, Cameroon, Central African Republic, Chad, Columbia, Papua New Guinea [8]. As at 2021 the production of yam in Nigeria was 50.4 million tones that accounts for 67.05% of the world's production [9]. Yams are the fifth most harvested crops in Nigeria, following after cassava, maize, guinea corn, and beans/cowpeas [10] Benue State ranks among the highest yam producing states in Nigeria with its cultivation cutting across all the three geopolitical zones [11].

The role played by yam in the food economy in West Africa cannot be over emphasized. Yam contributes more than 200 calories per person per day for more than 150 million people in West Africa [12].

Yam production provides a great deal of finance to farmers since it stores relatively better than many tropical crops and as such, sold for good prices during the lean season. Tropical root and tuber crops such as cassava, yam, and cocoyam are important household food security and income generating crops in many African countries [13, 14]. Yam is important in the local commerce in West Africa and accounts for about 32% of farm income [15]. Yam is again used as raw material for starch industries and pharmaceutical companies and provides employment for a great number of people [16]. The entire production, processing and marketing chain of yam offers vast employment opportunities for millions of people. The supply of yam creates prospects for income generation due to the number of people involved and the value attached to it. The marketing system, which affect the price received by farmer and those paid by buyer, has a profound impact on sustainable food security [2].

Yam is one of the most highly regarded staple food product in tropical countries of West Africa and are closely integrated into the economic, socio- cultural and religious aspects of life in the communities [18]. The ritual ceremonies and superstition often surrounding yam and its utilization in West Africa is a strong indication of the antiquity of uses of the crop [19]. New yam festivals still accompany yam production in some communities with a day set aside to celebrate the harvest of the new yams. These are indications of the high status given to the crop. In many yam growing communities in West Africa, yams play an important socio-cultural role, featuring in many traditional festivals and rituals

The aim of this research is to bring to the fore the different farming practices employed by different farmers in different locations of Benue state and their knowledge of causes and control measures of postharvest losses with the view to filling the gap of dearth of information on such practices.

Materials and method

Three major yam producing communities in three senatorial zones of Benue State were selected for the research work (Zaki Biam (Zone A) Gboko (Zone B) and Oju (Zone C). Simple random sampling procedure was used to select fifty farmers from each of the communities for data collection. The data was collected by the researcher using structured questionnaires and oral interview.

Information sought and collected from farmers include the varieties of white yam cultivated, pre-planting chemical treatments, herbicides usage, fertiliser usage, pre-storage chemical treatments. Other cultural practices investigated included methods adopted by farmers for the storage of yam, postharvest losses incurred by farmers, farmers' knowledge of causes of postharvest losses of yams during storage and farmers' knowledge of prevention measures against postharvest losses of yam. Data obtained from the survey was subjected to descriptive and simple statistical analysis.

Results and Discussion

Varieties of white yams cultivated (Local names) in Benue State:
Zones A and B: - Gboko and Zakibiam (Tiv speaking area): Faketsa, Hembakwase, Gbongu, Ogoja, Mumuye, Pepa, Danacha, Amula, Icheyol, Agatu, Anasue, Anyamyua, Tutube, Punch etc
Zone C: - Oju (Igede speaking area): Iwala, Ojibo, Okondo, Ovoh, Obwoo, Ochinkpe, Ogede, Ochon-akpa and Oyeye.
Land clearing: Percentages of farmers who use chemicals for land clearing are 82%, 86% and 88% for zones A, B and C respectively. The percentages of farmers who use manual method of land clearing is 16% for Zone A, 5% for Zone B and 11% for Zone C while 2%, 9% and 1% plough their lands in the Zones A, B and C respectively (see Figure 1).

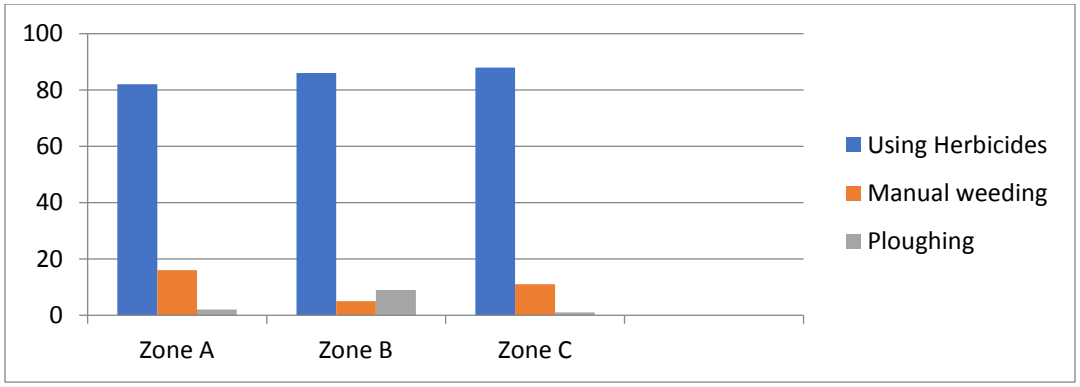

Figure 1 Method of land clearing by farmers

Method of planting: A few farmers plant their yams on ridges while most farmers in the surveyed communities plant their yams on heap (See Figure 2).

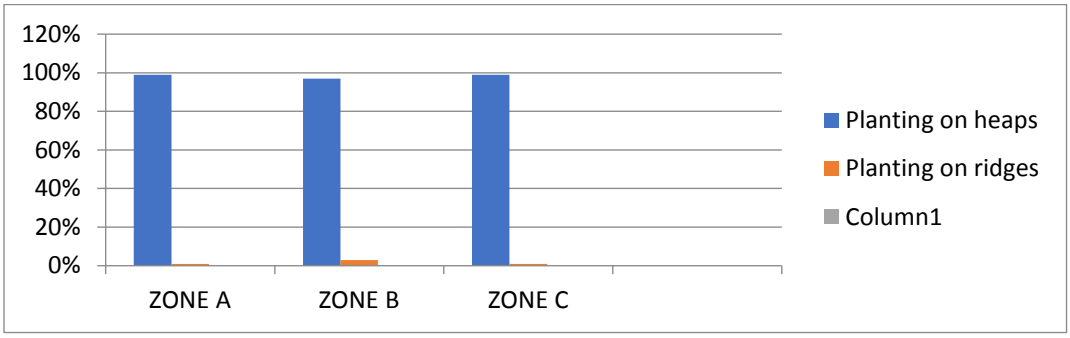

Figure. 2 Land preparation method for planting yam

Table 1. Farmers rating of white yam varieties based on harvest size (%)

SN	Yam Variety	Zone A	Zone B	Zone C
1.	Hembakwase	48	56	-
2.	Faketsa	24	18	-
3.	Ogoja	22	12	-
4.	Ojibo	-	-	42
5.	Okpnondo	-	-	36
6.	Ogede	-	-	18

7.	Others	6	6	4
	Total	100	100	100

Table 2. Farmers rating of white yam varieties based on market value or prices (%)

SN	Yam Variety	Zone A	Zone B	Zone C
1.	Ogoja	42	10	-
2.	Faketsa	36	60	-
3.	Hembakwase	22	30	-
4.	Ojibo	-	-	64
5.	Okpondo	-	-	18
6.	Ogede	-	-	9
7.	Ochinkpe	-	-	9
	Total	100	100	100

Table 3. Farmers rating of yam varieties based on shelf life/length of storage before spoilage (%)

SN	Yam Variety	Zone A	Zone B	Zone C
1.	Faketsa	48	28	-
2.	Hembakwase	36	54	-
3.	Mumuye	12	-	-
4.	Icheyol	4	-	-
5.	Ogoja	-	12	-
6.	Amula	-	6	-
4.	Ojibo	-	-	65
5.	Okpondo	-	-	12
6.	Iwala	-	-	18
	Total	100	100	100

Fertiliser Usage: Two major brands of fertilizer, NPK and Urea and a combination of the two are used by farmers in all yam producing communities surveyed. For Zone A, 84% of farmers use NPK, 6% use Urea while 10% use a combination of the two brands. The percentages for Zone B are 78%, 18% and 4% while those of Zone C are 80%, 19% and 1% respectively(See Figure. 3).

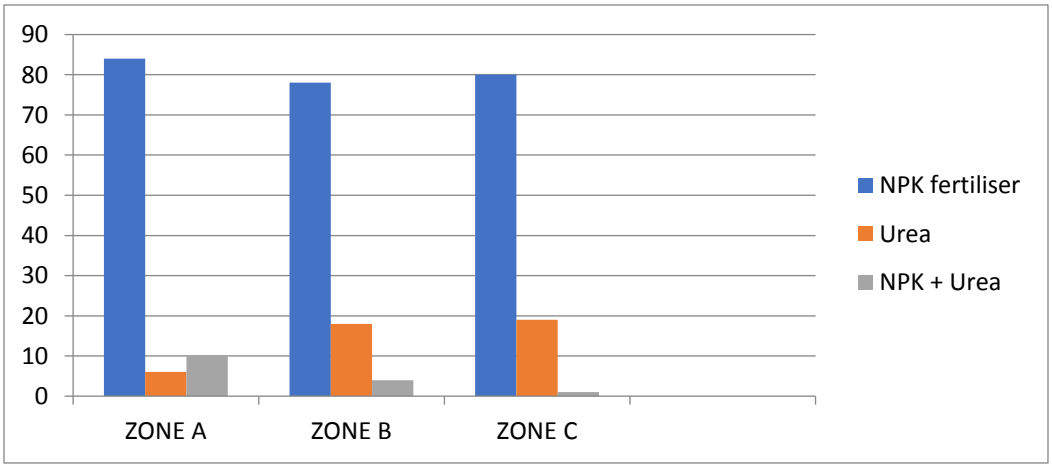

Figure. 3 Use of Fertilizer on yams by farmers

Storage methods: Three storage methods are used by farmers in the surveyed communities. Some farmers treat their yams with chemicals before storage (Fig.4). Most farmers store their yams in grass huts (52-68% for Zone A, 68% for B and 52% for C). Some farmers store their yams in zinc houses (26% for Zone A, 28% for B and 45% for C) while some leave in heaps covered with dry yam stems or grasses under shade of trees (6% for Zone A, 4% for B and 3% for C) (See Figure. 5).

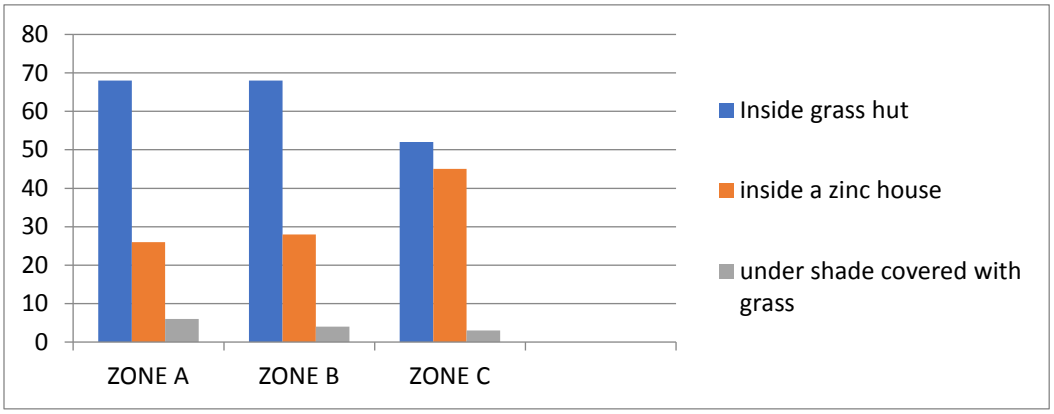

Figure.4 Yams storage methods by farmers

Postharvest losses: The survey reveals that 72%, 68% and 66% of farmers in Zones A, B and C respectively suffer 1-10% losses during storage. 18%, 27% and 24% in the respective zones suffer losses in the range 11% - 20% while 10%, 5% and 10% of farmers in the zones suffer losses of 20 -30% (Figure. 6).

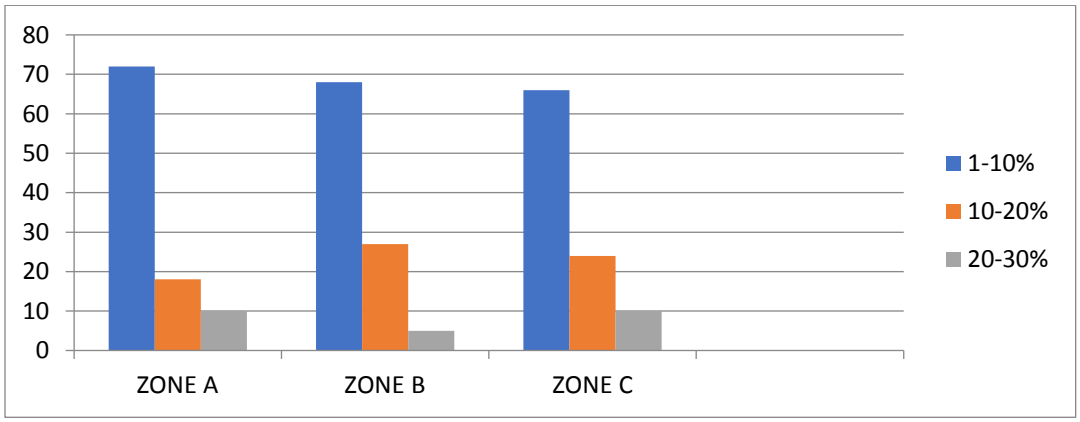

Figure 5. Losses incurred by farmers after 180 days (6 months) of storage

Farmers' knowledge of causes of postharvest losses and control measures: The farmers (respondents) attributed the losses on their harvested produce during storage to a number of contributing factors namely heat (40% for zone A, 42% for B and 36% for C), pests/rodents (26% for Zone A, 27% for B and 6%), poor ventilation (10% for Zone A, 7% for B and 12% for C), cuts/injuries (17% for Zone A, 19% for B and 4% for C) and chemicals/fertilizer application (7% for Zone A, 3% for B and 34% for C) (Figure 7).

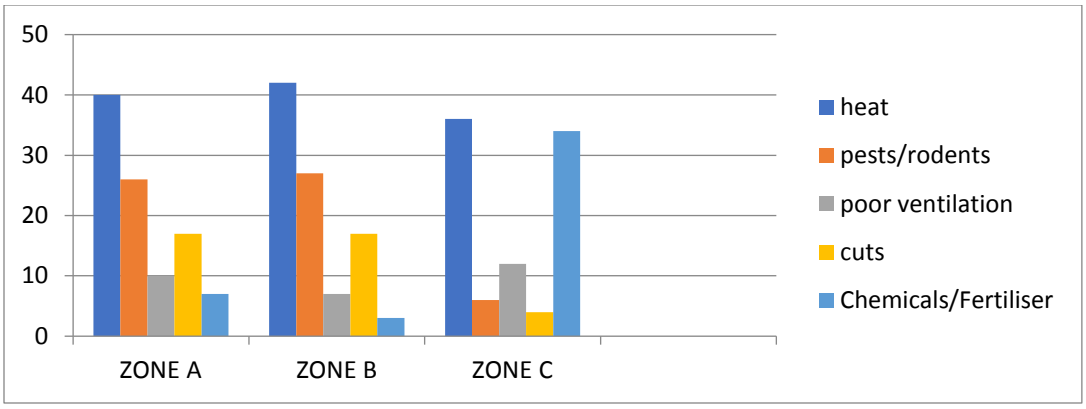

Figure 6. Farmers' knowledge of causes of postharvest losses in storage (%)

Farmers' knowledge of control measures for losses: They suggest measures of preventing such losses to include storing in airy place (30 for Zone A, 30% for B and 36% for C) preventing heat (36% for Zone A, 30% for B and 34% for C), control of pests/rodents (12% for Zone A, 24% for B and 12% for C), avoiding cuts/injuries (12% for Zone a, 6% for B and 9% for C), regular checking (9% for Zone A, 6% for B and 5% for C) and avoiding use of chemicals/fertilisers (1% for Zone A, 4% for B and 6% for C) (See Fig. 8)

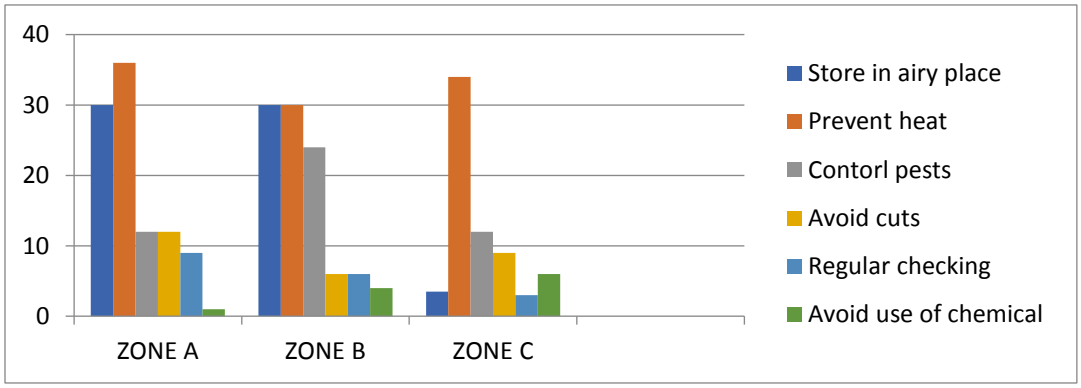

Figure 7 Farmers' knowledge of preventing/controlling postharvest losses (%)

DISCUSSION

Land Preparation: The survey has revealed that a greater majority of farmers in all the yam producing areas of the state depend on herbicides for clearing weeds during land preparation (see Figure 1). A similar survey by [20] in Ghana, which is next to Nigeria in the global ranking of yam production, revealed a similar trend. The researchers attributed the prominence taken by use of chemicals in land preparation over manual weeding to the dwindling labour force in rural communities as a result of rural-urban migration by youths in search of white collar jobs and partly due to expansion of farm sizes. Mechanical method of land preparation is almost negligible. This may be due to unavailability or cost of hiring farm machinery for the purpose.

Brand names of the herbicides used include: Force-Up, Sarosate, Vinash, Relisate , Royacut, Paraforce, Roundup, Glycin, Atrazine, Glyview, Weed-off, Clear Force, Royalcut, Mop-up, Clearweeds, Glyphosate, Glysate, Glyspring, Glyphosate, Paraquat, Dressforce etc.

A few farmers plant their yams on ridges while most farmers in the surveyed communities plant their yams on heap (See Figure 2). Yam is planted on heaps or ridges to allow the growing stem to have a wider space to spread for optimum growth and productivity. Planting on heaps also aids drainage and prevents rotting due to flooding [21].

Farmers rating of white yam varieties based on harvest size:

Farmers' rating of the local varieties of white yam cultivated in Zone A in terms of harvest size is 48% for Hembakwase, 24% for Faketsa, 22% for Ogoja and a total of 6% for others. In Zone B Hembakwase is also ranked highest with 56% followed by Faketsa (46%) Ogoja (12%) and 6% for other varieties. Ojibo tops the rating in Zone C with 42% followed by Okpondo (36%), Ogede (18%) and 4% for other varieties. See Table 1)

Farmers rating of white yam varieties based on market value or prices

Farmers in zone A rate Ogoja (42%) as the variety that attract highest price followed by Faketsa (36%), and Hembakwase (22%). In zone B Faketsa received the highest rating of 60% followed by Hembakwase (30%) and Ogoja (10%). The ratings for yam varieties in zone C were 64% for Ojibo, 18% for Okpondo, 9% for Ogede and 9% for Ochinkpe respectively (see Table 2).

Farmers rating of yam varieties based on shelf life.

In Zone A, 48% of farmers rate Faketsa as the variety that's store longest before it begins to spoil followed by Hembakwase (36%), Mumuye (12%), Icheyol (4%). The ratings in Zone B was Hembakwase (54%), Faketsa (28%), Ogoja (12%) and Amula (6%). In Zone C Ojibo ranked the highest (65%) followed by Iwala (18%), and Okpondo (12%) (see Table 3)

Fertiliser Usage:

A greater majority of farmers in all the communities apply NPK fertiliser on their yam farms figure 3). Yams are heavy feeders and thus constitute a heavy drain on the soil and hence require sufficient soil fertility for optimum yields [21]. These authors thus recommended that at least liberal dressing of mineral fertilizer especially NPK for increased yields. Over 49% increase in tuber yield has been reported from fertilised over unfertilised plots, thus supporting the use of mineral fertilizer in yam production [23].

Storage methods

Three storage methods are used by farmers in the surveyed communities but a majority of farmers in the surveyed areas use mud huts (Fig.4). Most farmers store their yams in grass huts. This type of storage is often encountered in the savannah areas of the yam belt that is, in regions with a pronounced dry season. The efficacy of yam storage structure for preserving yam is said to be influenced by environmental conditions such as relative humidity and temperature [5] noted that the mud hut protects yams from direct sun rays and heat thereby providing a cool environment for the stored tubers. Nahanga and Vera [28] noted that the mud hut protects yams from direct sun rays and heat thereby providing a cool environment for the stored tubers Ravindran and Wanasundera [25] however identified two major problems with the mud huts; lack of ventilation and the piling of the yams. They noted that both promote the formation of rot and the stored yams can only be checked with difficulty.

Postharvest losses

The survey reveals that majority of farmers in all the surveyed areas suffer storage of 1-10% while lesser percentage suffers higher under similar storage conditions (Figure. 5). Bonaventure [27] reported a similar range of losses incurred by farmers in a survey carried out in five communities of two districts in Ghana.

Farmers' knowledge of causes of postharvest losses and control measures

The farmers (respondents) attributed the losses on their harvested produce during storage to a number of contributing factors namely heat, pests/rodents, poor ventilation, cuts/injuries and chemicals/fertilizer application (Figure 6). They suggest measures of preventing such losses to include storing in airy place, preventing heat, control of pests/rodents, avoiding cuts/injuries, regular checking and avoiding use of chemicals/fertilisers (See Figure 7).

Conclusion

Yam is a major tuber crop cultivated by farmers across Benue state for both consumption and as a source of income for them. Farmers employ basically similar practices in the cultivation and storage of yams and they suffer an equal range of postharvest losses. Several local varieties are available in the state. However, there are preferences in the choice of varieties cultivated due to the variation in their sizes at maturity, storage life and the prices they command. Most farmers have a good knowledge of the causes and control measures of postharvest losses. Their suggestions and recommendations are consistent with those of Onwueme [26].

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