



Postharvest Spoilage of Irish Potato: A Survey of Farmers' Storage Practices in Mangu, Plateau State

***Damiyal, D.M¹; Adebitan, S.A²; Idi, S³; Jibung, G.G⁴**

¹Horticultural Technology Department, Plateau State College of Agriculture, Garkawa,

²Crop Science and Horticulture, Faculty of Agriculture, Federal University, Ikole Campus, Ikole/Oye Ekiti, Ekiti State,

³Agricultural Economics and Extension Department, Faculty of Agriculture, Abubakar Tafawa Balewa University, Bauchi,

⁴Agricultural Technology Department, Plateau State College of Agriculture, Garkawa.

ARTICLE INFO

Article No.: 100920118

Type: Research

Accepted: 16/09/2020

Published: 22/01/2021

***Corresponding Author**

Damiyal, D.M

E-mail: molchendamiyal@yahoo.com

Keywords: Irish Potato; Deterioration; Mangu

ABSTRACT

A survey was conducted among farmers in Mangu Local Government Area in 2006 on postharvest spoilage of potato (*solanum tuberosum* L.). Emphasis was on factors which predispose potato to spoilage and control measures adopted. Questionnaires (150) were randomly administered to individual farmers selected from six out of nine potato producing Districts in the study area. Properly filled and returned questionnaires were 145. Data were analyzed using descriptive statistics and regression analysis. Slightly over one third (36.55%) of the respondents did not destroy potato haulms before harvest while about two third of them (63.45%) destroyed the haulms one to three weeks earlier. Almost half of the respondents (45.66%) stored between 1-10 bags while 93.79% of the respondents stored Irish potato in a general store only 5.52% of them share the bedroom with potato. One respondent used pit (trenches) for potato storage. In order to reduce deterioration of potato tubers, 82.76% of the respondents frequently checked their produce under storage to remove infected tubers. Almost 9% sold their produce immediately after harvest to avoid spoilage in the store and 8.28% treat with chemicals. Regression analyses revealed that the time of harvesting after haulm destruction and type of storage structure used by the farmers have positive significant ($P < 0.05$) effect on deterioration of Irish potato and number of bags stored also significantly ($P < 0.01$) affect deterioration of the produce. The control measures applied by farmers have negative significant ($P < 0.05$) effect on deterioration of the total produce. The implication of the result is that farmers can reduce deterioration of their crops by decreasing the quantity of bags stored in a place at a time and increasing the control measures adopted. Therefore, a store room should be built solely for storing Irish potato by farmers.

INTRODUCTION

Irish potato (*Solanum tuberosum* L.) is a subtropical and temperate crop belonging to the family solanaceae. It is grown on a limited scale in some restricted medium to high altitude areas of West Africa (Opeke, 2006). Potatoes are herbaceous annual plants grown for their edible tubers (Chapman and Carter, 1996). In Nigeria it is mostly grown in the Jos, Mambila and Biu plateaux and part of Zaria and Kano (Ifenkwe, 1980). Irish potato is one of the world's major staple food crops and produces more dry matter and protein per hectare than the major cereal crops (Burton, 1989). Root crops (Irish potato, sweet potato, yam and cassava) provide about 8% of the total human energy intake compared to 20 percent by cereal grains (Kochhar, 1996).

As a rule, only mature tubers should be stored (Beukema and van Der za'ag, 1990). If there are reasons for harvesting and storing immature potatoes, it is advisable to destroy the haulms prior to lifting the tubers, as this stimulates the process of maturation of the skins. Furthermore, ventilation is needed to remove heat, water and carbon dioxide and to supply oxygen during storage. If the crops are pulled out two weeks before harvesting, then the skin becomes hardened and the potatoes are less likely to be damaged (MacDonald and Low, 1984). Wigginton (1984) states that tubers without sufficiently well developed skin are easily damaged and will lose much moisture during storage. Furthermore, micro-organisms can easily enter such tubers. Sarkar (2000) state that under good storage temperature of 1.7^oc – 2.2^oc and relative humidity of 70-80%. Irish potato can be stored for an indefinite period. Losses are much less than (between 1-2% generally). Mechanical damage is a major factor in post-harvest deterioration on root crops, therefore, vigorous pre-storage inspection to locate and remove damaged produce will help as a physical method of control (Hill and Waller, 1999). In Northern Ireland, Thiabendazole applied as ultra low volume spray at harvest is widely used to control dry rot and silver scurf as well as gangrene and skin sport (Logan *et al.*, 1975). MacDonald and Low (1984) recommended the spraying of potatoes with insecticides such as Dimethoate before storage in order to kill aphids. In Nigeria, the annual yield per hectare has not been documented where the crop is grown. Generally, a lot of losses ranging from tuber rotting, drying, sprouting and inability of some tubers to germinate occur. These pose serious problems to the farmers from the point of harvest to that of consumption.

Storage of the produce is further made more difficult with increasing production. This thus renders potato a seasonal crop. In the study area, reasons for the immense losses have always been based on mere assertions, as there have been no supporting empirical figures. Hence there is need for the present study in an area of major production in the state. It is envisaged that knowledge of the factors which predispose the crop to rapid deterioration in storage, and an understanding of

the control measures farmer use would encourage higher productivity of the crop.

MATERIALS AND METHOD

The research was carried out during the 2006 cropping season in Mangu Local Government Area of Plateau State. The area lies within latitudes 8^o56¹-9^o45¹ North and longitudes 9^o02¹-9^o16.5¹ East. Major crops cultivated in the area include maize, millet, finger millet, sorghum and beans (as food crops) and Irish potato, citrus, groundnut, sugarcane and cocoyam (as cash crops).

One hundred and fifty (150) copies of a structured questionnaire were randomly administered to individual farmers in six selected districts namely Ampang-West, Kombun, Kerang, Mangun Panyam and Mangu, out of nine Irish potato-producing districts. This design was aimed to encourage relevant and accurate responses and avoidance of misinterpretation. Literate respondents were allowed to fill the questionnaires by themselves while the illiterate farmers were assisted by reading and interpreting the questionnaires to their understanding while recording their answers, through scheduled interviews. One hundred and forty five (145) representing 97 percent of the questionnaires were properly filled and returned as scheduled by the respondents.

Descriptive statistics and regression analysis (Cobb-Douglas model) were used to analyze the data collected.

RESULTS AND DISCUSSION

Table 1 shows that 36.55% of the respondents did not destroy the haulms before harvest while 63.45% did at various time ranges from one to 3 weeks before harvest. This agrees with the independent works of MacDonald and Low (1984) who reported hardened skin of potatoes which were less likely to be damaged when haulms were removed two weeks before harvest. Wigginton (1984) reported that tubers without sufficiently well developed skin could easily be damaged, an affirmation of MacDonald and Low's (1984) findings.

Almost one half of the respondents (49.66%) stored between 1-10 bags of Irish potato while 22.07% stored between 11-15 bags, 8.27% stored between 16-20 bags and only 5.52% of the respondents stored 21-25 bags. It is however interesting to observe that 21 out of respondents (14.48%) stored more than 25 bags of potato in a year (Table 2). The quantity of produce stored implies that the farmers store a small quantity of their produces probably to avoid spoilage under storage and possibly for urgent cash need. On the type of storage structure used in the study area, 93.79% of the respondents used general store (where other crops are also kept) for storage, 5.52% of them shared their

bedroom with the crop. Only 0.69% of the respondents in Table 3 used pit (trenches). It is obvious from this study that farmers in the study area did not have a separate store for storing only Irish potato. They did not have modern storage structures such as: diffuse light storage structure and cool storage either. Lack of good storage structure could probably contribute to the high rate of spoilage of potato under storage. Sarkar (2000) stated that under good storage temperature of 1.7 – 2.2^oC and relative humidity of 75-80%, Irish potato can be stored for a prolonged period and minimal loss due to spoilage.

The control measures applied by farmers vary among the respondents, majority (82.76%) of whom frequently checked their produce in store to remove spoiled or rotten tubers, while 17.24% applied chemicals or sold their produce immediately after harvest in order to avoid spoilage in storage (Table 4). This agrees with the work of Hill and Waller (1999) who reported that vigorous pre-storage inspection to locate and remove damaged produce will also help as a physical method of control. The use of chemicals was similarly recommended (Logan *et al.*, 1975; MacDonald and Low, 1984).

The regression results of the Double-log function shows that 43.6% of the variation in the dependent variable (deterioration of Irish potato) was explained by variation in explanatory variables (time of harvesting after haulm destruction, implements used for harvesting, means of

packaging the produce for transportation, number of bags stored, type of storage structure used, reasons for deterioration of potato in store and control measures adopted by farmers to prevent or reduce losses in store) included in the model. The remaining 56.4% may be attributed to other factors not included in the model. The joint explanatory power of the factors was further confirmed by the F-ratio (9.27^{***}) which was significant (P<0.001), implying that taking together, the included variables significantly explain variations in the total deterioration of Irish potato stored (Table 5).

The regression coefficient with respect to a particular variable shows the extent to which variation in that variable explains variation in the dependent variable. For example, the regression coefficient with respect to number of bags stored is 0.8607 (P<0.001) implying that one percent increase in number of bags stored by potato farmer holding all other factors constant will increase deterioration by 0.8607 percent while the regression coefficient with respect to control measures adopted by farmers to prevent or reduce losses in store was -0.6793 at less than 0.05 probability level thereby implying that one percent increase in the control measures adopted by farmers will lead to decrease in deterioration of potato stored by -0.6793 percent (Table 5). The use of chemical to control pests and diseases was similarly recommended (Logan *et al.*, 1975; MacDonald and Low, 1984).

Table 1: Time of harvesting Irish potato after haulm destruction

Time of harvesting after haulm destruction	No. of respondents	Percentage (%)
Those that did not destroyed the haulm	53	36.55
After one week	49	33.79
After two weeks	12	8.28
After three weeks	14	9.66
Others, specify	17	11.72
Total	145	100

Table 2: Number of bags stored by potato farmers

Number of bags	No. of respondents	Percentage (%)
1-10 bags	72	49.66
11-15 bags	32	22.07
16-20 bags	12	8.27
21-25 bags	8	5.52
> 25 bags	21	14.48
Total	145	100

Table 3: Types of storage structure used in storing Irish potato

Storage structure	No. of respondents	Percentage (%)
Modern storage structure	0	-
General store	136	93.79
Store inside sleeping room	8	5.52
Others, specify	1 (pit)	0.69
Total	145	100

Table 4: Methods of control applied by farmers

Methods of control	No. of respondents	Percentage (%)
Applying chemical	12	8.28
Frequent checking to remove spoiled or rotten tubers	120	82.76
Selling of produce immediately after harvest	13	8.97
Others, specify	0	-
Total	145	100

Table 5: Regression analysis of some of the parameters in potato handling from harvesting to utilization

Variables	Regression coefficient	T-values
Constant	-1.5119	-2.90**
X ₁	0.472	2.24*
X ₂	0.8598	1.51 ^{NS}
X ₃	-0.1257	0.88 ^{NS}
X ₄	0.8607	5.74***
X ₅	2.704	1.80*
X ₆	-0.1509	-0.75 ^{NS}
X ₇	-0.6793	-1.92*

Y = Quantity of produce which deteriorate under storage (in 50kg bags)

X₁ = Time of harvesting after haulm/top destruction of the crop

X₂ = Implements used for harvesting

X₃ = Means of packaging the produce for transportation

X₄ = Number of bags stored

X₅ = Types of storage structure used

X₆ = Reasons for deterioration of Irish potato under storage

X₇ = Control measures adopted by farmers to prevent or reduce losses in store

R² = 43.6% F-ratio = 9.27***

Note:

NS = non significant

*** = significant at P < 0.001

** = " " " P < 0.01

* = " " " P < 0.05

CONCLUSION

The high rate of deterioration of Irish potato during storage in the study area is due to several factors which include damage of the tubers before storage (thereby predisposing the tuber to infection by disease agents), poor storage facilities (where good ventilation is lacking) and poor management practices by farmers such as lack

of haulm destruction before harvest to enhance hardening of the tuber shortly before their removal from the soil. Therefore, farmers should handle potato tubers carefully during and after harvest in order to reduce wound damage to the tubers before storage.

REFERENCES

- Beukema, H.P and Van Der Za'ag, D.E (1990) Introduction to Potato Production. Pudoc Wageningen. 208pp
- Burton, W.G. (1989) The Potato. Third edition. Longman, London 742 pp.
- Chapman, S.R and Carter, L.P (1996). Crop Production Principles and Practice. W.H. Freedman and Company, San Francisco. 566 pp.
- Hill, D.S. and Waller, J.M (1999). Pests and Diseases of Tropical Crops. Vol. 2. Field Handbook Agricultural Series. Longman Group, U.K. 4th edition. 432 pp.
- Ifenkwe, O.P (1980). National Accelerated Food Production Late Blight. Pp 30. Kormava, M. (1999). Food Demand Structures and Market Studies for International Institute of Tropical Agriculture, Ibadan Mandate Crop. Kormava, P and Aiyedun, E. (eds). In: Food Demand and Market Studies in Drier Savanna of Nigeria. Proceeding of a Stakeholder Workshop, Kaduna.
- Kochhar, S.L (1986). Tropical Crops. A Textbook of Economic Botany. Second edition Macmillan Publisher Ltd, London and Basingstoke 467 pp.
- Logan, C., Copeland, R.B and Little, G. (1975). Potato gangrene control by ultra low volume sprayers of thiabendazole. Annals of Applied Biology 80: 199-204.
- MacDonald, I. and Low, J. (1984) Fruits and Vegetable. Evan Brother Ltd 137 pp.
- Opeke, L.K (2006) Essentials of Crop Farming, Spectrum book limited Ibadan, Nigeria. 305 pp.
- Sarkar, A. (2000). Modern Handbook of Agricultural Science PA-155 Loyal book Depot College Road Meerut. 150 pp.
- Wigginton, M.J (1974). Effect of temperature, Oxygen tension and relative humidity on the wound healing process in the potato tuber. Potato Research 17:200-214.

Cite this Article: Damiyal, DM; Adebitan, SA; Idi, S; Jibung, GG (2021). Postharvest Spoilage of Irish Potato: A Survey of Farmers' Storage Practices in Mangu, Plateau State. *Greener Journal of Agricultural Sciences* 11(1): 1-5.