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SURVEY OF POTATO (*SOLANUM TUBEROSUM L*) BACTERIAL, VIRAL AND FUNGAL DISEASES IN BWAI DISTRICT, MANGU LOCAL GOVERNMENT AREA OF PLATEAU STATE

By

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Abstract: A survey of bacterial, fungal and viral diseases of potato (*Solanum tuberosum*) was conducted between July and August 2014 cropping season in some villages of Bwai district in Mangu Local Government Area. The survey was carried out in five major villages by a random survey approach for selection of farms. The survey was carried out using Completely Randomized Design (CRD) with the villages considered as treatments and the farms as replicates. A picture book containing an overview and description of disease symptoms to aid in field identification of the different diseases was used. Vascular flow test (VFT) was also used to confirm bacterial infections. Percentage occurrence of bacterial disease in the villages ranges between 1.26% and 4.75%, viral infection ranges between 0.98% and 1.81% while fungal disease ranges between 8.31% and 9.98%. Data collected was transformed before used in the analysis of results. There was significant difference in the occurrence of bacterial disease in the five villages while fungal and viral disease did not show any significant difference. These infections are attributed to the used of farmers saved seeds already attacked with disease before planting and late planting also contributed.

Key words: Survey, bacterial, fungi, virus, diseases

INTRODUCTION

Potato (*Solanum tuberosum L*) belongs to the tuber crops and the crop belong to the family solanaceae. Potato was introduced into Nigeria in late 19th century, through missionary activities (Obighesan, 1976; McNeill, 199). The production was encouraged by the British colonial government during the Second World War as the tubers were needed to feed their armed forces in West Africa. Since then, the importance of potato has been widely realized such that it is now an important commodity in both local and international trade (Ugonna *et al* 2013).

Although production of potato has increased by over 12% in the last 10 years in Nigeria (FAO, 2008), it is still grossly below demand. Apart from low quality seeds and poor storage facilities, diseases are also a limiting factor to potato production in Nigeria (Ifenkwe and Suchomel, 1983).

Potato is the fourth world's largest food crop following rice, wheat and maize. Root and tuber crops have contributed significantly to staple food requirements in many developing countries, ensuring food security at national and household levels. The major roots and tuber crops used in Nigeria include: cassava, yam, sweet potato, coco yam and Irish potato. Potato have been part of the regular feeding habit of many Nigerians. The crop is a major contributor to cross-substitution when other food items (grains) are in short supply (Ndor, 2013) potato is fairly new to Sub-saharan Africa (SSA). World production of potato as of 2009 was estimated at 330 million tones and over two third of the global production is eaten directly by humans with the rest being fed to animals. To underscore the importance of potato in addressing the world food crisis, the United Nations officially declared

2008 as the “International year of Potato” in order to raise its profile in developing nation, calling the crop “Hidden treasure” (FAO, 2008). Although potato has been identified to be the fourth most important root crop in Nigeria, after cassava, yam and cocoyam (Okonkwo *et al*, 2009) it is an efficient tuber crop in the country in terms of tuber yield and days of maturity, not much has been done toward promoting the industrial uses of the crop. Irish potato was introduced into Plateau State by missionaries and Tin mining activities on the Jos Plateau where production was limited to small garden plots until the Second World War in 1939. In Nigeria today, this crop is being cultivated in commercial quantities in Plateau State (Bokkos, Mangu, Barkin-ladi, Jos South, Bassa, Riyom, Jos North and Pankshin Local Government Areas) (Okonkwo and Amadi, 1995). It can also be grown in far northern states of Nigeria during the cold harmattan season under irrigation (Dimlong, 2012, Lenka D.M *et al* 2008, PADP, 1994).

Since potato was introduced into Nigeria since 19th century, the crop yield per hectare and total production remained very low until the establishment of Potato Research Centre Kuru Jos Nigeria in 1976. The development of efficient storage methods, adaptation of true potato seed technology for seed production and development of improved varieties contributed to increase yield. Despite the progress made, some of the production constraints indentified a decade ago remain a major challenge to increase potato production and expansion in Nigeria. Among these constraints inadequate supply of good quality seeds to farmers is the most important (Okonkwo *et al*, 1995).

The varieties imported years ago are still used for planting and most of the varieties have been unknowingly mixed by farmers, some have been infected by virus and other diseases resulting in yield decline. Farming systems such as intercropping, global warming and human activities are recently promoting diseases such as blight. A yearly report of potato late blight (PLB) in potato farms in Plateau State is a concern with records of 100% loss. Plateau State is noted for its favourable climate which makes it a habitation for foreigners and also the cultivation of many crops that are alien to other regions of the country. In Nigeria more than 85% of potato production is done by farmers who maintain small farms. This survey is aims at surveying the bacteria, fungi and virus diseases prevalent in the target area and to identify any tolerant variety and to suggest ways of reducing infection.

MATERIALS AND METHODS

A field survey was carried out between July and August, 2014 cropping season n Potato farms to determine the prevalence of foliar bacterial, fungal and viral disease infections in major villages of Bwai district, Mangu Local Government Area of Plateau State. A picture book (CIP, 2009a) which contained clear picture plates of foliar parts attacked by the above mentioned diseases was used to identify the diseases in the fields. A data collection form containing the name of variety, disease, farm visited, number of plant stands and percentage infected was used for field assessment. A random survey approach was used for selecting of survey sites/farms. Five (5) villages were surveyed with five farms in each village.

Disease incidence was assessed using eight (8) rows (beds) per farm. Number of diseased plants over the total stands times hundred ($x/n \times 100/1$) to obtain percentage (%) incidence of disease per farm. The survey was carried out using Completely Randomized Design (CRD) with the villages considered as treatments and farms as replicates (Ndor, 2013). For disease symptoms which look alike such as bacterial and fungi, the Vascular Flow Test (VFT) was used. It involved cutting of the wilting stem, placing the piece face up as it was in the plant in a transparent glass containing water. Few minutes later if a milky thread would stream down from the stem piece the wilt was a bacterial wilt. If tried 2 – 3 stems that were wilting and have not seen the flowing ooze then the wilting has been caused by something else (CIP, 2009). The data collected was transformed using the $(x + 0.15)^{1/2}$ (square root transformation) and result was subjected to Analysis of Variance (ANOVA).

RESULTS

Table 1: Percentage occurrence of Potato foliar diseases in some villages of Bwai district, Mangu Local Government Area.

Villages	Bacteria	Fungi	Virus
Chisu	1.67	9.54	0.98
Kubon	1.26	9.78	1.19
Mpil	2.58	8.31	1.81
Nambung	4.75	8.84	1.74
Timmanle	2.25	9.62	1.00
LSD (5%)	3.55	-	-

Table 1 shows the percentage occurrence of potato foliar diseases in villages of Bwai district. The result shows that the occurrences of bacterial diseases were significantly different among the villages. Nambung village was marginally highest in occurrence (4.75%) while Kubon was least with 1.26% occurrence.

Table 2: Percentage infection of potato foliar diseases in five varieties of potato in Bwai District, Mangu Local Government Area

Varieties	Bacteria	Fungi	Virus
Bahwondoya	1.24	9.50	1.06
Diamond	1.97	9.53	1.27
Eldy	1.74	9.05	1.29
Nicola	1.67	9.75	0.93
Yellow	2.44	8.26	1.28
LSD (5%)	-	-	-

Percentage infections by bacterial, fungi and virus foliar disease in Bwai district are shown in table 2. The diseases of potato were not significantly different amongst the varieties of potato cultivated in Bwai District. However, bacterial diseases has high infection in Yellow (2.44%) and least in Bahwondoya (1.24%) fungi disease infection was marginally high in Nicola (9.75%) and least in Yellow (8.26%) while viral disease infection was high in Eldy (1.29%) and least in Nicola (0.93%).

DISCUSSION

The bacterial, fungal and viral diseases have a multiple effect when the same seeds obtained from previous harvest are used as the case is with farmers in developing countries. Some of the low level infections of these diseases not seen or detected (CIP, 2009b). This means that the survey cannot give the true percentage infections and percentage occurrences may be higher than recorded. Infections are higher during raining season due to favourable conditions for infections to occur. Nevertheless early planting and crop rotation may check the incidence of the diseases. The table 1 shows high bacterial diseases in all the villages of Bwai district, with high occurrence of fungi diseases in Kubon (9.78%). This district is at the border with Bokkos Local Government Area with reported cases of potato late blight (PLB) and movement and exchange of seeds are freely done.

CONCLUSION/RECOMMENDATION

Although Nigeria is the fourth largest producer of potato in sub-saharan Africa with production yield of about 843,000 tonnes per year and most of this is from Plateau State, there are still some constraints which limit potato production. Potatoes in Nigeria are cultivated mainly by small, rural farmers of the country mostly in Jos Plateau, Mambilla and the Obudu Hills. Low yields are due to inadequate supply of good quality seeds, because the imported improved variety of seeds has been used over a number of times. This has significantly reduced its potency. Disease outbreaks such as potato late blight (PLB) are a yearly occurrence with 100% loss recorded without systems for healthy seed production. Considering the above challenges training farmers on “select the best” for seeds selection needs to be carried out in the production areas such as Bwai district. Modern Screen houses need to be built to grow tissue – cultured potatoes resistant to these diseases to avoid the use of costly fungicides for fungal diseases.

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