



SURVEY OF POTATO (*SOLANUM TUBEROSUM L*) BACTERIAL AND VIRAL DISEASES IN BOKKOS LOCAL GOVERNMENT AREA OF PLATEAU STATE NIGERIA.

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Abstract: A survey of bacterial and viral diseases of Potato (*Solanum tuberosum L*) was conducted during the 2010 cropping season in Bokkos Local Government Area of Plateau State. The survey was carried out in 14 major villages by a random sampling approach to select 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 (CIP, 2009) containing an overview and description of disease symptoms to aid in field identification of the different diseases was used. The vascular flow test was carried for the identification of bacterial wilt. The percentage occurrences of bacterial and viral infections ranges from 10% - 45.58% and 10% to 44.50% respectively. The percent occurrences of both diseases were not significantly different amongst the villages surveyed. Tuber infections varied from 10% to 46.88% for bacterial and 11.25% to 41.03% for viral infections. However, the differences are insignificant amongst the villages. The paucity in information on potato diseases in Nigeria is because research is generally in its infancy probably due to limited areas suitable for the production in Nigeria. From the results, the need for proper screening of imported clones and training of farmers on seed selection (select the best) needs to be carried out in the production areas to help cope the build-up of these diseases.

INTRODUCTION

The potato (*Solanum tuberosum L*) also called Irish potato is a starchy, tuberous crop from the perennial *Solanum tuberosum* of the *solanaceae* family (also known as the Night shade). It is the world's fourth largest food crop following rice, wheat and maize. The crop is fairly new to Sub-Saharan Africa (SSA) where it was introduced in the 19th century through activities of European Missionaries (Mcneil, 1999). The United Nations Food and Agricultural organization (FAO) reports that world production of potatoes in 2009 was 330 million tones. Over two thirds of the global production is eaten directly by humans with the rest being fed to animals or used to produce starch.

Potatoes were introduced to Nigeria during the 1920s probably by way of Germans living in the Cameroons and other Europeans involved in Tin mines on the Jos Plateau. Production was limited to small garden plots until the Second World War when the British colonial Government encouraged potato cultivation to help feed servicemen in West Africa. Over the years potato production in Nigeria has been on the increase as Nigeria has the largest area used in potato production in Africa but produces the lowest yield (output) compared to other African countries due to high cost of production and poor management and agronomic practices amongst farmers. One of the biggest problems for small scale potato farmers in developing countries is the lack of affordable high quality seed potatoes i.e. those tubers used to multiply potatoes. It is difficult and expensive to produce seed

potatoes and multiplication is slow (CIP, 2009a). Many plantings are needed to get lot of seed. Transporting and storing seed potatoes are also complicated. As a result of this, high quality seed potatoes are expensive. Small scale potato growers particularly in developing countries are generally not in that position to pay premium prices for seed potatoes as they lack the necessary cash income. The high price and limited awareness among farmers leads to the common recycling of seed. Farmers use the small tubers saved from their last harvest as seed for their next planting. This results in a build-up of diseases. If the seed potatoes are re-used from the own crop over and over again as practice in developing countries, the yield will decrease over the seasons due to seed degeneration as a result of a build-up of diseases which are passed on through the tubers.

Bacterial and viral diseases are the most important seed-borne diseases of potato (CIP 2009a). Bacterial wilt is usually recognized in the field by farmers but often misinterpret the actual causes. Virus diseases are a major problem when recycling seed, and are mostly not understood and recognized at all. The diseases are often overlooked because the symptoms are usually not as striking as those incited by fungi and bacteria. Research in potato diseases are generally in its infancy in Nigeria. Given that the Irish potato in Sub-Saharan Africa and indeed Nigeria is grown in an ecosystem with diverse wild and cultivated *solanaceous* species, there is the potential that hitherto unimportant diseases infecting these related species can become of epiphytotic concern as production expands.

Plateau has a sole comparative advantage in potato production in Nigeria with 95% of total country production done in plateau State (Dimlong, 2012). Potatoes are grown in 9 local government areas of the 17 local government areas of the state with Bokkos as the leading producing Local Government Area. With the use of farmers saved seeds over the years seed degeneration is obvious. This study is aimed at surveying potato diseases (particularly bacterial and viral) in Bokkos Local Government Area of Plateau State. This will create awareness to farmers and to suggest ways to reduce infection thus increase yield.

MATERIALS AND METHOD

A field survey was carried out during 2010 cropping season to determine the prevalence of potato bacterial and viral diseases in Bokkos local Government Area of Plateau State where potato production is high. The survey was conducted in September when disease infection is expected to be high due to favourable conditions for foliar disease development such as high rainfall and relative humidity at this period (Alexander, 2000). A random survey approach was used for selection of survey sites (farms). Fourteen village and five farms with plants of about eight weeks old were selected in each village for assessment. Disease incidence was assessed selecting eight (8) ridges per farm. Total number of diseased plants relative to total number of plants in each ridge multiplied by 100 obtained percentage (%) incidence of disease per farm. Tubers were also assed at harvest time in these farms. The survey was carried out using Completely Randomized Design (CRD) with the villages considered as treatments and the farms as replicates (Ndor & Ekefan E.J 2009). All data collected were subjected to Analysis of Variance (ANOVA) and Fishers Least Significant difference (FLSD) was used to separate possible significantly different means. A picture book (CIP, 2009b) containing an overview and description of disease symptoms to help identify the different diseases was used where symptoms look similar e.g. to ascertain symptoms are caused by bacterial wilt, the vascular flow test is used. This involved the cutting of a wilting stem, place it in a clean glass of water, making sure the top of the stem piece faces up as it was in the plant. Within few minutes milky threads stream down from the stem piece if the wilting is caused by a bacterial. If tried 2-3 stems that were wilting and have not seen the flowing ooze, the wilting has been caused by something else (CIP 2009a).

RESULTS AND DISCUSSION

Table 1: Percentage incidence of Bacterial and viral foliar infection of potato from various villages in Bokkos Local Government Area.

<u>VILLAGES</u>	<u>BACTERIAL</u>	<u>VIRAL</u>
Daffo	15.50	10.00
Focus	25.58	44.50
Ganda	10.00	40.75
Hottom	40.25	29.25
Hurti	45.58	18.75
Joshow	19.75	23.63
Kuba	30.50	30.50
Maiduna	16.13	31.63
Malul	45.25	40.25
Meshakas	24.25	27.75
Taddia	40.25	37.25
Taggai	30.05	20.00
Tahang	13.75	15..25
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F(LSD 5%)	N.S	N.S

Table 1 shows the percentage incidence of bacterial and viral foliar infection of potato surveyed from various villages of Bokkos Local Government Area. The result shows that both bacterial and viral disease foliar infections are not significantly different amongst the villages. Hurti and Malul villages appears to have high bacterial foliar infections but not significantly different from other villages. Similarly, Ganda recorded the least percentage occurrence amongst the villages.

Focus village recorded the highest level of viral infection among the villages surveyed. Daffo has the least foliar viral infection marginally.

Table 2: Percentage incidence of Tuber Bacterial and Viral Infection on Potato from various villages surveyed in Bokkos L.G.A.

VILLAGES	BACTERIAL	VIRAL
Daffo	18.25	11.25
Focus	23.88	22.00
Ganda	10.00	35.13
Hottom	29.25	41.63
Hurti	40.50	15.25
Joshow	27.38	25.25
Kuba	25.00	37.88
Maiduna	37.38	25.88
Malul	46.88	27.50
Meshakas	29.75	35.63
Taddia	40.25	29.75
Taggai	24.25	25.13
Tahang	12.25	18.25
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F(LSD 5%)	N.S	N.S

The percentage incidence of Tuber bacterial and viral infections on potato from various villages in Bokkos are shown in Table 2. The result shows that there is no significant difference amongst the villages in both the bacterial or viral Tuber infections. However, Malul and Hottom villages appear to be marginally higher in tuber infection of bacterial and viral respectively. Ganda and Daffo villages recorded least percent infection of bacterial and viral tuber infections respectively.

The bacterial and viral diseases have a multiple effect when the same seeds obtained from previous harvest are used as the case is with Bokkos farmers virus diseases cause different symptoms in potato including various shades of mosaic, mottle, leaf roll, crinkle and necrosis depending on the virus strain, potato clones and other environmental factors. Some of the low level infections of both bacterial and viral are not seen or detected (CIP, 2009). This means that percentage occurrence may be higher than recorded. Pointed out the disease symptoms are often severe when the viruses occurred in mixed infections and the yield losses can be up to 80%. Such combinations have been found in a serochianostic survey in Nigeria in 50% of the samples tested.

CONCLUSION AND RECOMMENDATION

A field survey of Irish potato bacterial and viral diseases was conducted during the 2010 cropping season in Bokkos Local Government Area of Plateau State.

A picture book (CIP, 2009b) containing an overview and description of disease symptoms was used to identify the diseases. Data recorded was analyzed using the Completely Randomized Design (CRD) and subjected to Analysis of Variance (ANOVA). The result shows that there were infections of both the bacterial and viral diseases in all the villages but not significantly different from each other. These diseases are important in potato production since can cause damage of up to 100%. Many countries in the Sub-Saharan Africa such as Nigeria are in the process of expanding their potato production, which has often involved the importation of improved clones, the need for proper screening must be emphasized. A training of farmers on “selects the best” for seeds selection needs to be carried out in the production areas.

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