

**SURVEY OF POTATO (*SOLANUM TUBEROSUM L*) BACTERIAL, FUNGAL, AND VIRAL DISEASES  
IN IRRIGATED FADAMA AREAS OF KURU (JOS SOUTH) AND KERANG (MANGU)  
LOCAL GOVERNMENT AREAS OF PLATEAU STATE, NIGERIA**

**Ndor, D. C.**

Department of Agricultural Technology, Plateau State College of Agriculture, Garkawa, Plateau State, Nigeria  
E-mail: dombinndor@gmail.com

**Abstract**

A survey of bacterial, fungal and viral diseases of Potato (*solanum tuberosum L*) was conducted in farmers' fields between November 2012 and March 2013 dry season cropping in some fadama areas in Villages of Kuru and Kerang of Jos South and Mangu Local Government Areas, respectively. The Survey was carried out in six villages by a random survey approach for the selected of farmers. The survey was carried out using completely randomized design (CDR) with the Villages considered as treatments and the farms as replicates. A picture book (CIP, 2009b) containing an overview and description of disease symptoms to help in field identification of the diseases was used. Vascular flow test was also used to confirm bacterial infection. Percentage occurrence in the villages ranged from 11.77 to 45. 21%. Infections by viral disease ranged from 3.33 to 93.67%; while bacterial ranged from 0.00 to 8.33% and fungal from 6.00 to 39.00%. There were significant differences in percentage infections of these diseases amongst the villages. Levels of infections were higher in fadama areas of Kuru villages than that of Kerang Villages. These infections were attributed to the use of farmers' own seeds which were been recycled over the years. It was therefore recommended that farmers in the study areas should be trained on "select the best" technique for seed selection to reduce the multiples effect of these diseases. Government should also encourage the production of seed potatoes by private companies.

**Keywords:** Potato, irrigation, bacterial, fungal viral, diseases.

**Introduction**

The Potato (*Solanum tuberosum L*) also called Irish potato is a slouchy tuberous crop of the family solanaceae . It is the world's fourth largest food crop following rice, wheat and maize.

Root and tuber crops have contributed significantly to the staple food requirement in many developing countries, ensuring food security at the national and household level. These major roots and tuber crops used in Nigeria ranges from Cassava, Yam, Sweet Potato, Cocoyam and Irish potato. These crops have been part of regular food habit of many Nigerians and major contributors to cross-substitution when other food stuffs are in short supply (FAO, 2008). Roots and tuber crops production and marketing

Serve as major sources of income and employment to the rural populace in many African countries.

The Crop is fairly new to sub-saharan Africa (SSA) where it was introduced in the 19<sup>th</sup> century through the activities of European missionaries (Mcneil, 1999). World production of potato in 2009 was estimated at 330 million tones and over two thirds of the global production is eaten directly by humans with the rest being fed to animals or used to produce starch(Wekepedia, 2010) China is now the world's largest producing country and nearly a third of the world's potatoes are harvested in China and India.

Irish potato was introduced in Nigeria during the 1920s, by way of Germans living in the camerouns and by other European involved in missionaries and Tin mining activities on the Jos Plateau, where production was limited to small garden plots until the second world war in 1939 when the British Colonial Government encouraged potato cultivation to help feed service men in West Africa (FAO 2008). It is the most fruitful and efficient tuber crop in the world in terms of tuber yield and days to maturity. It matures in about 60 to 90 days as compared to 9 to 12 months of yam and cassava respectively (NRCRI, 2005, Kudi *et al.*, 2008). It gives the highest yield per unit area among roots and tuber crops in Nigeria and also more income to farmers. In Nigeria today, this crop is being cultivated in commercial quantities in two states namely, Plateau (Bokkos, Mangu, Barkin-Ladi, Jos South, Bassa, Riyom, Jos-North and Pankshin L.G.As) and Taraba (Sarduna L.G.A. and Mambilla Plateau) (Okonkwo *et al.*, 1995b), Dimlong, 2012). It can be grown in far northern states of Nigeria during the cold harmattan season under irrigation.

The production and marketing of Irish potato in Plateau State has become an integral part of the rural economy both at the rainy and dry season as it is cultivated as rain fed and dry season crop (Okunade and Ibrahim, 2011; PADP 1994) planting of rain fed potatoes take place from late March to August, depending on local condition planting of potato under irrigation (dry season production) starts from late October through January.

The dry season production accounted for over 20% of the total annual output (NRCRI, 2005; Kudi *et al.*, 2008).

A lot have been made in research and development programmes and Projects in an effort to improve. Potato productivity of small holder farmers in Nigeria, this is evident by the establishment of potato programmer in Kuru near Jos in Plateau State. These in turn have led to high level of activities in Potato Production and Marketing all year round (Okonkwo *et al.*, 1995). Mohammed (2009), noted that, over 50, 000 hectares of land have been under potato irrigation on the Plateau every dry season by individual cooperative group, Government agencies and Hausa migrant farmers.

However, these efforts have focused on adoption of Agronomic Practice, introduction of high yielding varieties and storage facilities with most focus on the rainfed Potato Production.

Ifenkwe (1989) compared Potato Production on flats and ridges during dry season, and examined fertilizer requirement for Potato/wheat intercrop in the dry season. Other researchers have compared profitability and technical efficiency of rainfed and dry season Potato Production in Plateau State and Ndor (2003) surveyed disease under rainfed while Dihal *et al.* (2010) examined Varietal response of Potatoes to irrigation scheduling.

With the effect of Climate change resulting in flooding, dry season farming is highly encouraged and with the over increasing hectarage for dry season farming required focus in terms of research. The importation of varieties of Potato by the National Fadama World Assisted Programme and the Agricultural Services Training Centre (ASTC) OF Plateau State Government requires research in the area of Production, since the most limiting factor in Potato Production are seed-borne disease (CIP, 2009a).

Potato Producers in the developing world face the problems of inadequate supply of certified seeds and majority of small holder farmers almost solely depend on informal seed source (farm saved seeds, Local markets and from Neighbors) this according to Muthari and Nyamonyo (2009), encourages the spread of seed-borne diseases from one season to the next. Farmers usually select seeds at harvest from their own farms and periodically go outside their farms to bring in “new” or “fresh” seeds (seed renewal).

Okonkwo *et al.* (1995); Fane *et al.* (2003) and Muthoni and Nyamongo (2009), established that serious challenges to Irish Potato Production are incidence of pest and diseases which contributed to yield reduction in the developing world.

The bulk of Potato produced in Nigeria comes from the Jos Plateau. Dry season farming is also high due to the availability of mining ponds of the colonial era. With the use of farmers saved seeds over the years, seed degeneration is obvious. Flooding as a result of climate change in the raining season, has made irrigation a better alternative to farming and governments all over encouraged dry season farming. This study is aim at surveying potato diseases cultivated under irrigation in some parts of Jos Plateau. This will create awareness to farmers and to suggest ways to reduce infection thus increase yield.

### Materials and Methods

A field survey was carried out between October 2012 and March 2013 on irrigated potato farm to determine the prevalence of foliar potato bacterial, fungal and viral diseases in some fadama areas of villages in Jos South and Mangu Local Government Areas of Plateau State. A random survey approach was used for selecting of survey sites/farms. Six villages in all were surveyed. Disease incidence was assessed selecting five rows (beds) per farm for assessment. Total number of diseased plants relative to total number of plants in each row multiplied by 100 obtained percentage (%) incidence of disease per forms. The survey was carried out using completely Randomized Design (CRD) with the villages considered as treatments and the farms as replicates (Ndor and Ekefan, 2009). A picture book (CIP, 2009a) containing an over view and description of disease symptoms was used to help identify the different diseases. Where symptom look similar e.g. to ascertain symptoms caused by bacterial wilt, the vascular, flow test is used. This involved the cutting of a wilting stem, place 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 milk threads stream down from the stem piece if the wilting is caused by a bacterial wilt. If tried 2-3 stems that were wilting and have not been seen the flowing ooze, the wilting has been caused by something else (CIP, 2009b).

All data collected were subjected to Analysis of variance ANOVA and least significant Difference (LSD) was used for separation of significantly different means.

### Results

Table 1 shows the percentage incidence of potato foliar diseases in villages of Kuru and Kerang fadama areas under irrigation. The result shows that diseases occurrences were not significantly different amongst the villages. However, Dakyen is Highest in incidence (45.21% in marginally while Mansa is least (11.77%) in percentage incidence.

Percentage infection of viral, bacterial and fungal foliar diseases in villages of kuru and Kerang fadama areas are presented in table 2. These major diseases of Potato differs significantly amongst the villages of Kuru and Kerang. Viral infections in villages of Kerang (Mansa 3.67; Fwangkwak 3.33% and Fomulan 7.67%) are statistically the same where as incidence in kuru villages are significantly different at five percent level of significance. Kuru villages are more infected by the diseases generally compared to Kerang villages. Dakyen village of Kuru is most infected by foliar potato disease of virus and fungi. The table shows high infection of viral foliar disease, follow by fungal disease generally.

### Discussion

The viral, bacterial and fungal 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 are not seen or detected (CIP, 2009b). This means that the survey cannot give the true percentage infections and percentage occurrence may be higher than recorded. Infections are higher during raining season due to favorable conditions for infection and seeds are obtained from the raining season production for cultivation in the dry season under irrigation. Table 2 shows a level of bacterial infection compared to viral and fungal infections, this may be due to the fact that bacterial easily cause rotting of seed potatoes and are easily detected and selected by the local farmers. Infections generally can be caused by irrigation scheduling i.e the amount and frequency of water application which is still a problem in developing countries due to lack of technology. The fadama areas have been under potato cultivation for years thus encouraged disease build up also.

### Conclusion and Recommendation

The result shows that there were infections of viral, Bacterial and fungal diseases but more in Kuru generally than Kerang . These diseases are important in Potato Production since it can cause damage of up to 100%. Many countries in Sub-Saharan Africa such as Nigeria are in the process of expanding their Potato production and with the effect of climate change leading to floods; dry season farming is being encouraged. A training of farmers on "Select the best" (CIP 2009b) for seeds selection needs to be carried out in the production areas to reduce multiple effect of these diseases. Government should also encourage the Production of seed Potatoes by private companies.

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Table 1: Percentage incidence of potato foliar diseases in some villages of Kuru and Kerang areas under irrigation.

Villages	% incidence
Dakan	41.98
Dakye	45.21
Dahwak	30.59
Mansa	11.77
Fwangkwak	18.32
Fomulan	16.49
LSD 5%	-

Table 2: Percentage infection of Viral, Bacterial and fungal foliar diseases in villages of Kuru and Kerang fadama areas under irrigation;

Village	Viral	Bacterial	Fungal
Dakan	85.33	8.33	14.33
Dakye	93.67	2.00	39.00
Dahwak	58.00	0.00	17.33
Mansa	3.67	4.67	6.00
Fwangkwak	3.33	7.00	8.67
Fomulan	7.67	6.33	7.33
LSD 5%	5.15	5.11	14.23