SURVEY ON INCIDENCE AND SEVERITY OF WATERMELON ROOT ROT AND VINE DECLINE IN KANO, NIGERIA.

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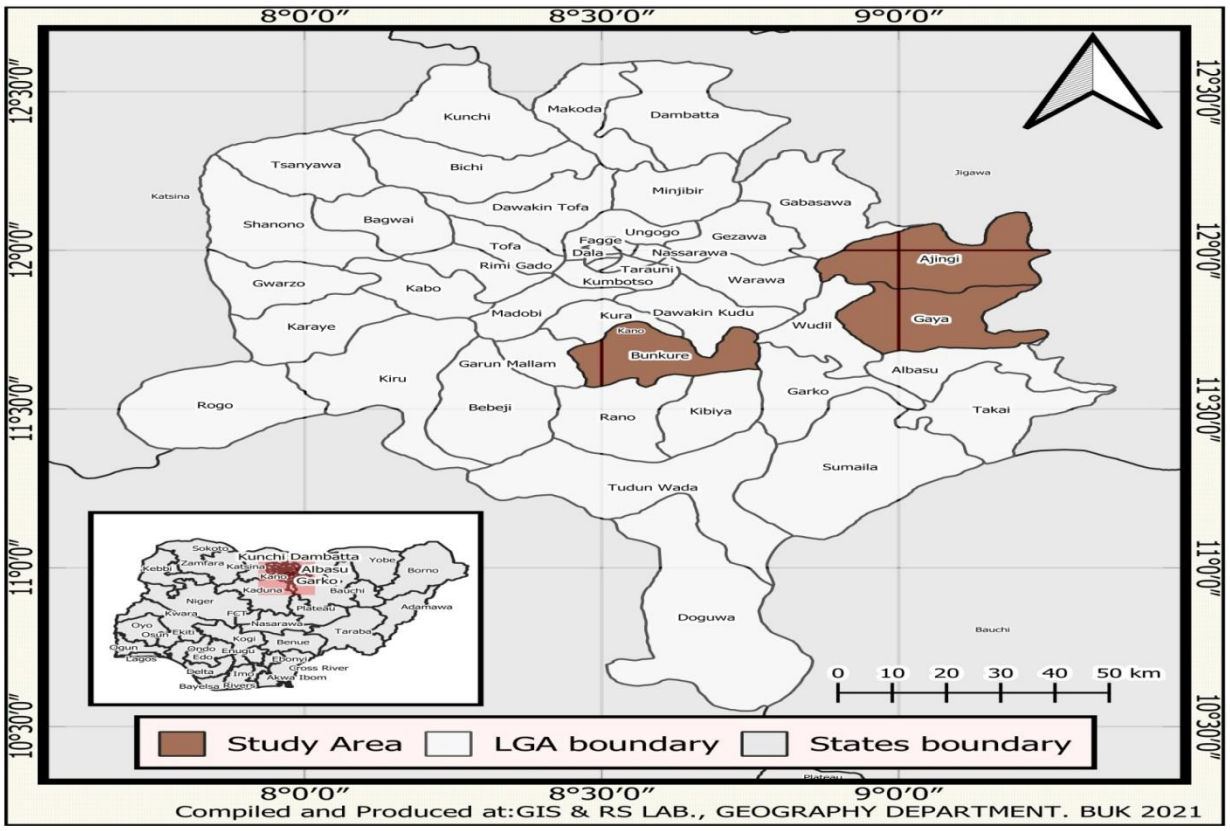
ABSTRACT
Field survey was conducted in Ajingi, ($11^0$58'45.899 N and longitude $8^0$56'27.41E), Bunkure, (Latitude $11^0$6835N and Longitude $8^0$54412E), and Gaya ($11^0$83946N and longitude $9^0$7544E) local government areas of Kano state. The objective of the research was to assess incidence and severity of watermelon root rot and vine decline. Ten towns were selected randomly in each LGA and three farms in each town were also randomly selected. Data on disease incidence and severity was recorded and subjected to analysis of variance after transformations. Results revealed least incidence (72.3) and severity (1.74) of watermelon root rot and vine decline in Bunkure which differed significantly with those obtained in Ajingi with disease incidence of 91.7% and 2.6 severity values. Gaya recorded the highest incidence of watermelon root rot and vine decline (93%) and disease severity of 2.95. Yield of watermelon infected watermelon root rot and vine decline in the three LGAs was significantly ($P<0.005$) highest in Bunkure (11 tonnes $ha^{-1)}$ Ajingi and Gaya which had 10.7 and 10.4 tonnes ha^{-1}, respectively, following the pattern of the disease incidence and severity. This survey will serve as a baseline for further study in developing management package that could be used to reduce watermelon root rot and vine decline and improve watermelon yield in the state.

Keywords: *Citrulluslanatus*, field survey, incidence and severity, watermelon root rot and vine decline

INTRODUCTION
Watermelon (*Citrulluslanatus*) (Thunb.) Matsum & Nakai) is a warm season crop belonging to the family *Cucurbitaceae*. It is an important vegetable crop grown for its large fruit (Rhodes and Zhang, 1999). China is the world's largest watermelon producer with a total production of 92.7 million metric tonnes (mmt) followed by Turkey (4.7mmt) Iran, (3.5mmt) and Brazil which produces 2.4 mmt (FAOSTAT, 2010). Watermelon is relished by many people across the globe as fresh fruit that is highly nutritious and thirst quenching. The crop contains vitamins A, C, several minerals, lycopene and beta-carotene that have been reported as anti-cancer compounds and powerful antioxidants that protect body cells against damage by free radicals (Adekunle *et al.,* 2005; Kim, 2008). Production of the crop is affected by several diseases, prominent among them is root rot and vine decline causing yield loss of 50% to 100% (Robert 2007). Researchers have investigated the cause of watermelon root rot and vine declines and many organisms were found associated with the disease. *Monosporascus* spp is one of the pathogen described as causal agents of the disease and it's called *Monosporascus* root rot and vine decline according to Martyn (2007). *Monosporascus*root rot and vine decline is caused by the devastative soil-borne ascomycetes (*Prenomycetes*) fungus *Monosporascus cannonballus (*Pollack &Uecker) reported by (Martyn and Miller (1996). In cases where *M. cannonballus* has not been found, other fungi like *M. eutypoides, Acremonium cucurbitacearum* and *Rhizopycnisvagum* found to be present (Anon, 2006). Other workers such as Roberts *et al*., (2007) and Roberts *et al*., (2008) attributed cause of the diseases to viruses. As a result of the important of this fruit it has been imperative to know the level of its differential prevalence in the areas where this crop is cultivated in kano state. The objective of the study was to determine the incidence and severity of watermelon root rot and vine decline (WRRVD) and the yield of the crop in three major watermelon producing areas of Kano state.

MATERIALS AND METHODS
A field survey incidence and severity of watermelon root rot and vine decline was conducted in three local government areas (LGAs) of Kano state. The three LGAs are: Ajingi ($11^0$58'45.899 N and longitude $8^0$56'27.41E) Bunkure, (Latitude $11^0$6835N and Longitude $8^0$54412E), and Gaya ($11^0$83946N and longitude $9^0$7544E) as presented on Plate 1. Five quadrants were used in each of the three farms randomly selected in each town. A total of ten (10) towns were chosen in each LGA. Thirty towns and ninety farms (90) were assessed for the survey. A randomized complete



block design was used as experimental design; farms were taken as blocks while quadrats were considered as replications. Data on disease incidence and severity of watermelon root rot and vine decline (WRRVD) were recorded within each quadrant ($3m^2$) and fruit yield was also recorded.

Data on disease incidence and severity were recorded at the fruiting stage (7^{th} WAS) and fruit yield was measured at harvest (10^{th} WAS). Assessment of disease incidence was done based on visual observation of disease symptoms. This was calculated based on the formula used by Sseruwagi*et al.,* (2010).

$$\text{Disease incidence} = \frac{\text{(Number of watermelon plants infected with WRRVD) in a quadrant}}{\text{(Total number of watermelon assessed in a quadrant)}} \times 100$$

Severity of WRRVD was assessed using a rating scale of 0 – 5, according to Robert *et al.,* (2007), where 0 =healthy plant, 1 = foliage exhibiting yellowing, 2 = wilting, 3= yellowing and necrosis, of one or more runners, 4 = most of the plant are affected by all symptoms of vine decline more than 50%, 5 = death plant.

RESULTS

Result presented in Figure 1 showed the incidence of watermelon root rot and vine decline (WRRVD) in Gaya, Ajingi and Bunkure local government areas (LGAs) of Kano State. Gaya exhibited the highest disease incidence (92.9%) which differed significantly ($P<0.005$) from those recorded in Ajingi (91.7%) and Bunkure (72.3%), respectively. Severity of the disease from the surveyed LGAs followed a similar pattern with disease incidence (Figure 2). Watermelon planted in Bunkure significantly showed the least disease severity value (1.74) compared to those in Ajingi and Gaya with disease severity values of 2.6 and 2.95, respectively. Bunkure significantly ($P<0.005$) produced the highest yield (11 tonnes ha^{-1}) with respectively followed by Ajingi (10.7 tonnes ha^{-1}) and Gaya (10.4 tonnes ha^{-1}) as presented in Figure 3.

Incidence and severity of WRRVD in Bunkure LGA is showed on Table 1.Least disease incidence was recorded at Zangon Buhari (49.4%) compared to the other towns within the LGA. Watermelon cultivated in Gurjiya significantly ($P<0.005$) had the highest incidence of WRRVD (81.7%) but showed statistically similar disease incidence with the other towns except Zangon Buhari.. A similar observation was made on severity of the disease in which watermelon grown in Gurjiya exhibited the highest disease severity which was at par with the values obtained on watermelon in other towns, apart from Zangon Buhari which significantly had the lowest disease severity (1.22).

Watermelon yield followed same trend with the disease incidence and severity. Zangon Buhari had the highest yields (11tonnes ha^{-1}) which differed significantly with the yields obtained from the other towns which were all at par.

Results in Table 2 show the incidence and severity of WRRDV and yield of watermelon in Gaya LGA. Least disease incidence was recorded on watermelon in Usan (76.2%), followed by those in Hausawa (88.8%), Yola (88.8%), Kalhaddi (88.7%) and Balan (88.6%) which were statistically similar but significantly lower than WRRVD incidence from other towns. Sanidan recorded the highest severity value (3.58), followed by Tsaida (3.00), Sabongari (3.09), Ni, ima (3.18) and Cuyawa (3.08). Usan also had least severity (2.92) compared to Hausawa (3.43), Yola (3.48), Kalhaddi (3.03) and Balan (3.48) which were all at par. There was also significant difference among the towns in terms of yield. Usan significantly produced watermelon with the highest yield (8.34 tonnes ha^{-1}) compared to other towns. Though yields obtained from the other towns differed but were not significantly different from each other.

In Ajingi, disease incidence was significantly lowest on watermelon grown at Chiromawa area with 82.5% WRRVD incidence than any other towns in the local government. Lowest severity index was found in Tsebarawa (2.02) then Marayan Kwadi, Fagawa, Juma, Balare, Zango, Chiromawa and Balle which were all statistically similar. Highest disease severity was obtained in Unguwar Bai which recorded 2.96 severity indexes which reasoned to the mono cropping practiced of watermelon. Tsebarawa significantly produced the highest yield 10.4 tonnes ha^{-1}while least yield (8.1 tonnes ha^{-1}) was recorded in Unguwar Bai (Table 3).

DISCUSSION

Disease symptoms observed in the surveyed areas at flowering and fruiting stage shows yellowing, wilting, brown leaf, death of the vine or the whole plant fewer weeks before harvest. Tthese diseases symptoms were in line with the reported of Morrissey *et al*., (2005) who stated that vine decline disease affect crops mostly at the fruiting stage. There was a drastic decline in yield due to the death of some vines which is in line with the finding of Robert (2004), who reported significant yield lost from 50% to 100%.

CONCLUSION AND RECOMMENDATION

The result of the study confirmed the occurrence of watermelon root rot and vine decline in Ajingi, Bunkure and Gaya local government areas of Kano State. The disease was most prevalent in Gaya than Ajingi and Bunkure local government areas, respectively. This could serve as baseline for further studies to develop eco-friendly and sustainable control package for the management of watermelon root rot and vine decline in the study areas.

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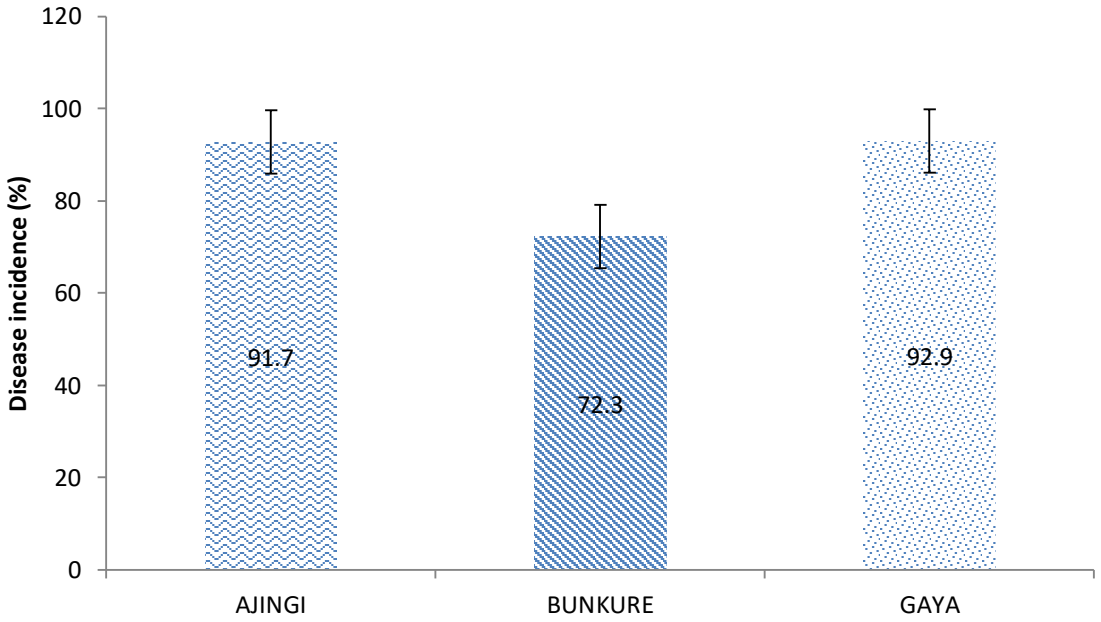

Figure 1: Incidence of watermelon root rot and vine decline in Agingi, Bunkure and Gaya local government areas of Kano State

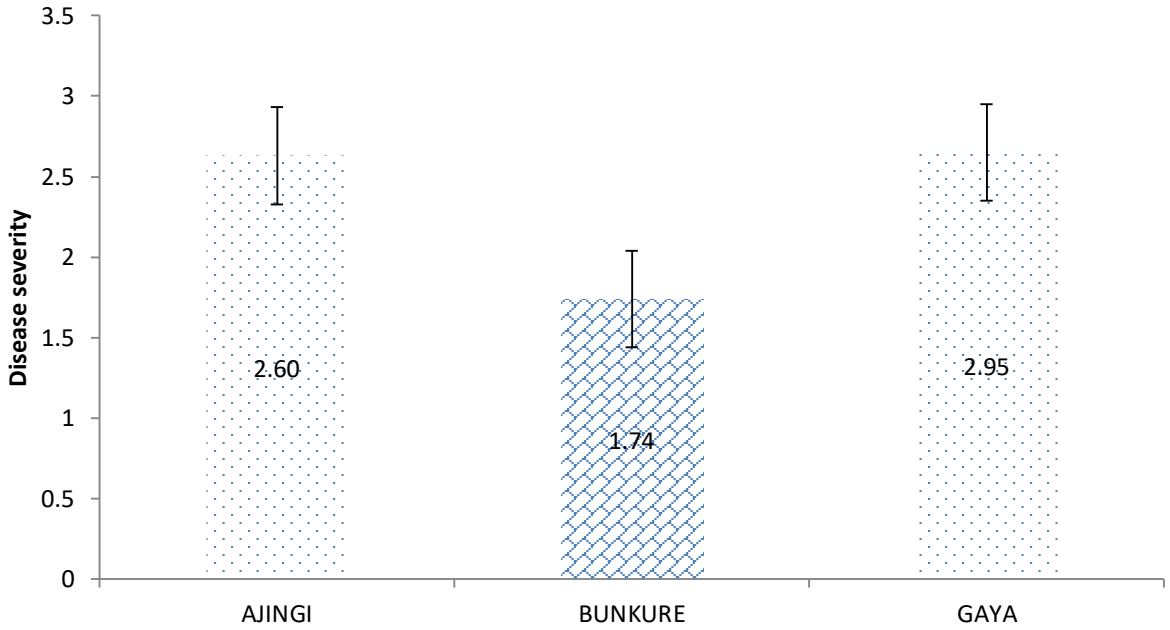

Figure 2: Severity of watermelon root rot and vine decline in Agingi, Bunkure and Gaya local government areas of Kano State

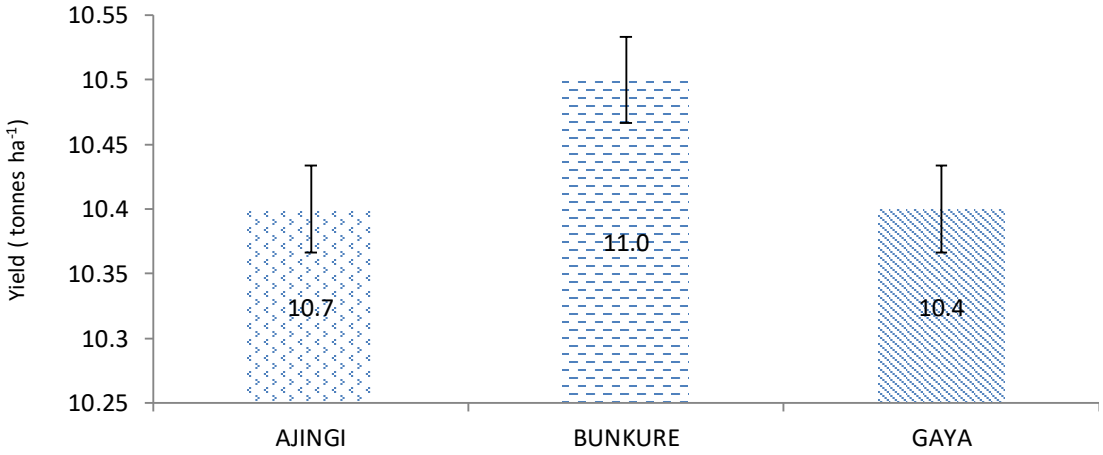

Figure 3: Yield of watermelon infected with root rot and vine decline in Agingi, Bunkure and Gaya

Table 1: Disease incidence and severity of watermelon roor rot and vine decline and watermelon yield in Bunkure GA of Kano state

Towns	Disease Incidence (%)	Disease severity	Yield (tonnes ha^{-1})
SabonRuwa	67.6b	1.7b	10.83d
Gafan	70.8bc	1.81b	9.84b
Zangon Buhari	49.4a	1.22a	11.1de
FakonMazana	76.8bcd	1.84b	10.03abc
GidanKaji	80.6cd	1.68b	10.74cd
FeginSaa	69.7d	1.86b	10.1bc
Sagugu	66.1b	1.84b	9.51a
Gwamma	71.6bc	1.72b	10.1abc
Gurjiya	81.7cd	1.89b	9.97b
Masaura	73.3bc	1.78b	10.8d
SE± (P<0.05)	3.42	0.10	0.22

Means followed by the same letter are not significantly different at 5% level of probability using Student-Newman-Keuls (SNK)

Table 2: Disease incidence and severity of watermelon roor rot and vine decline and watermelon yield in Gaya GA of Kano state

Towns	Disease Incidence (%)	Disease severity	Yield (tonnes ha^{-1})
Hausawa	88.8b	3.43c	7.57b
Yola	88.7b	3.48	7.62b
Usan	76.2a	2.92b	8.34a
Kalhaddi	87.7b	3.03b	7.79b
Balan	87.6b	3.48c	7.44b
Cuyawa	100c	3.08b	7.81b
Ni,ima	100c	2.18a	7.77b
SabonGari	100c	3.09b	7.53b
Tsaida	100c	3.00b	7.89b
Sanidan	100c	3.58d	7..67b
SE± (P<0.05)	2.52	0.14	0.21

Means followed by the same letter are not significantly different at 5% level of probability using Student-Newman-Keuls (SNK)

Table 3: Disease incidence, severity and yield of watermelon infected with roor rot and vine decline in Ajingi LGA of Kano state

Towns	Disease Incidence (%)	Disease severity	Yield (tonnes ha^{-1})
Marayan Kwadi	93.1b	2.50bcd	9.0.9bcd
Zango	91.7b	2.82e	9.64e
Tsebarawa	91.9b	2.02a	8.17a
Fagawa	94.0b	2.32b	8.75b
Juma	95.5b	2.42bc	8.95bc
Unguwar Bai	96.2b	2.96f	10.40f
Chiromawa	82.5a	2.86e	9.73e
Gurjiya	97.5b	2.85	9.74e
Balare	100b	2.78de	9.59de
Balle	100b	2.64cde	9.35cde
SE± (P<0.05)	2.90	0.10	0.17

Means followed by the same letter are not significantly different at 5% level of probability using Student-Newman-Keuls (SNK)