SCREENING OF SOME TOMATO (*Lycopersicon esculentum* MILL) LINES FOR RESISTANCE TO FUSARIUM WILT IN IMO STATE, NIGERIA.

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ABSTRACT
Investigations were carried out to screen five tomato (Lycopersicon esculentum Mill) varieties for resistance to Fusarium **Number of Number of Number of** *Wilt in 2008 cropping season. These varities included ROMA VF, UC82R (IMP), Sokoto local, Jos local and Zaria local which is the control. The experiment was arranged in a Completely Randomized Design (CRD) with five replications, giving a total of twenty-five (25) plots. The treatments were inoculated with a Fusarium isolate, except the control, one week after transplanting (wat).Data on growth parameters and disease incidence were collected and statistically analysed for differences using Gensat version 4 analytical software. The means were separated using Fisher's least significant difference. Results showed that Fusarium wilt has significant ($p<0.05$) effect on the height and the number of leaves of tomato plant; while disease incidence did not have significant ($p>0.05$) difference among the treatment means.*

Key Words: Tomato varieties, Fusarium wilt, susceptibility, screening.

INTRODUCTION

Tomato is an indispensable constituent of the daily diet of over one hundred million Nigerians (AVRDC,1989). Tomato belongs to the Solanaceae family. It is used in the preparation of soups and stew which are essential for consumption of cereals and roots. Although it is widely grown in Nigeria, the major areas of production are in the Northern Guinea Savanna ecological zones and South-western parts of the country between latitude 7.5^0N, and 13^0N (Denton and Swarup, 1983). Tomato is also produced near the southern states of Nigeria (Anon, 1989).

The major factors militating against minimum tomato production are pests and diseases. It is prone to numerous plant diseases, more than other vegetables. Denton and Swarup (1989) stated that at least twenty-five (25) diseases attack the tomato plant. These are caused by different parasitic organisms. The main fungal disease implicated is vascular wilt caused by *Fusariumo xysporum* (Nesmith and Hartman, 1982). Fusarium wilt is considered a warm temperature disease favoured by wet conditions and is soil-borne. Miller *et al* (1996) listed solanaceous crop-plants (tomato,potato,pepper, and eggplant) as the targets of the wilt organisms, and may be affected at any stage by the fungus. The infection processes of the wilt organism were also stated by Miller *et al* (1996).

These pathological problems have resulted to little or no production of the crop in these areas, especially in Owerri, area of south eastern Nigeria. Consequently, farmers, sellers and buyers have consistently and solely depended on the purchases from other major production zones of the country (Nwokeji, 2016). Transportation hazards and costs further constitute serious threats to their lives and profitability from the tomato business.

In order to drastically reduce these problems it is suggested that farmers should produce the crop within the geographical areas of the south east of the country, including Owerri ; thereby enhancing the chances of more economic and financial returns (Nwokeji, 2016).There is, therefore, the dire need to screen the tomato varieties, with the objective of determining the ones that are least susceptible to the endemic problem of Fusarium wilt.

MATERIALS AND METHODS

The research was conducted during the 2008 cropping season, at the School of Agriculture and Agricultural Technology Research Screening House, Federal University of Technology, Owerri. Technology, Federal University of Technology, Owerri, Imo State, Nigeria, in the year, 2011. The location is situated at 5.4891^0N and $7^0.025853$"E. The soil of the area is characterized by deep, porous, red soil, highly weathered and low in mineral reserves (Ononiwu, 1990). The area has a minimum and maximum temperature ranges of 20 ^{o}C and 32 ^{o}C respectively, with a mean annual rainfall of about 2,500mm, which spans a period from early March to October, with a dry spell (August Break), and relative humidity of between 38% and 99% annually (Nwosu and Adeniyi, 1980 Five tomato cultivars, obtained from NIHORT, Ibadan, (Roma VF, and UC82-R (IMP)) and Owerri local market (Zaria local, Jos local and Sokoto)), were raised in nursery in poly bags. Transplanting to experimental plots was done after four(4) weeks, when the seedlings had attained a height of 10 to 20cm (Amati *et al*, 1989).

The experimental plots, comprising twenty-five (25) polybags were serially numbered and filled with garden soil each. The five tomato cultivars (seedlngs), including the control, were assigned to the plots through random numbers (Wahua, 1999).

The treatments were indicated as follows: ROMA VF, UC82-R (IMP), Zaria local, (the control), Jos local

and Sokoto local. The set-up was arranged in a Completely Randomized Design (CRD) with five replications, totaling 25 plots.The treatments were inoculated with a Fusarium isolate, except the control, one week after transplanting.

ISOLATION AND IDENTIFICATION OF *Fusarium oxysporium*

Samples of tomato plants with typical wilt symptoms were collected from the tomato field located near the school farm for isolation and identification of the wilt pathogen (*Fusarium oxysporum*) in the School laboratory. The adhering soil particles were washed off the roots, stems, and leaves under running tap water, then distilled with sterile water. The plant specimen was surface – sterilized with 70% alcohol and rinsed with sterile, distilled water. Pieces of the diseased plant specimen (about 0.5 cm)were cut from the advancing margins of lesions and placed in calcium hypochloride (between 0.5 – 1%)after five minutes. Later the tissues were lifted with alcohol – flamed forceps unto hardened agar medium in Petri – dishes (Mehrotra and Aggarwal, 2006). The plates were then incubated in the laboratory incubator at ambient conditions of light and temperature($30+\_ 2^{0C}$) for 4-6 days.

Colonies of *Fusariumoxysporium*, identified by preparing slides and viewing the spores under a compound microscope were re-isolated in fresh agar slants, and sub-culturing continued until the emergence of pure cultures.Identification was done on the basis of spore morphology, colour of mycelium and nature of hyphae, as described by Scagel*et al*, (1984) and Barnett (1967).

PATHOGENICITY TEST

To test the pathogenic effect of *Fusariumoxysporium*, the treatments (tomato seedlings) were inoculated with a Fusarium isolate, except the control (Zaria local), one week after transplanting. This was done by cutting the agar discs as prepared above, taking from the advancing edges of the pure culture using a 1mm cork borer and transferred to the injured parts under moist conditions (Mehrotra and Aggarwal, 2006).

Disease incidence was taken by recording the total number of infected plants per plot divided by the total number of plants per plot, multiplied by 100.

The data collected were subjected to analysis of variance (ANOVA), according to the procedure for a completely randomized design (CRD) as was outlined by Wahua (1999). Test for significant differences among treatment means was performed using Least Significant Difference (LSD) at 5% level of probability.

RESULTS AND DISCUSSION

The effects of Fusarium wilt on tomato plant, number of leaves and disease incidence were shown in Tables 1 to 3 for all the experimental treatments.

Table 1 shows the effect of Fusarium wilt on the average heights of tomato plant. Analysis of variance performed showed a significant ($P<0.05$) difference among the tomato varieties. The tallest plant was Sokoto local although it was inoculated with Fusarium isolate. The least plant height was observed in ROMA VF tomato variety.The performance in Sokoto variety could be due to the inherent genetic quality of the variety.

Table 1: The Effect of FusariumWilt on the Average Heights of Tomato Plant

TREATMENT	MEAN (Tomato Height - CM)
ROMA VF	42.4
UC82R (IMP)	55.6
ZARIA	100.5
JOS	99.6
SOKOTO	108.5
LSD(0.05)	**= 29.8**

Table 1 shows the effect of Fusarium wilt on the number of tomato leaves. The results showed that the treatments varied significantly ($P<0.05$) in their production of the number of leaves. However, the control treatment (Zaria local) and Jos local varieties produced more number of leaves(219.96 and 277.73, respectively). On the other hand, ROMA VF variety recorded the least number of leaves. This could zbe attributed to their individual genetic variability. Agrios (2005) corroborated the above statement, stating that plant varies with inherent (genetically determined) disease resistance.

Table 2: The effect of Fusarium Wilt on the number of tomato leaves.

TREATMENT	MEAN (Number of Tomato leaves per Plant)
ROMA VF	86.11
UC82R (IMP)	123.18
ZARIA	219.96
JOS	277.73
SOKOTO	157.83
LSD (0.05)	**= 201.6**

Table 3 shows the disease incidence of tomato plant under different treatment combinations.

This showed that the response of the various treatments to the wilt disease. There was no significant (P>0.05) difference in the degree of susceptibility exhibited by the various tomato varieties.

Sokoto local varieties were most affected by the tomato wilt pathogen, as the disease incidence was the highest (10.56%). This was followed by UC82R(IMP) and Jos local varieties (9.45%) respectively. However, the control treatment (Zaria local) recorded the lowest incidence (6.67%).

The resistance or susceptibility of different varieties of tomato to Fusarium wilt, caused by *F. oxysporum*, might not be as a result of differences in morphological or structural features, but could be due to variations in biochemical defence mechanism (Chester, 1947). The biochemical defence consists of the presence of particular substance in the host which interferes with the growth and multiplication of the pathogen (Bost, 2004). The chemical may be produced before or after infection.

Table 3: The disease incidence of tomato plant under different treatment combinations.

TREATMENT	MEAN (Disease Incidence per Treatment)
ROMA VF	8.34
UC82R (IMP)	9.45
ZARIA	6.67
JOS	9.45
SOKOTO	10.56
LSD (0.05)	**=ns**

CONCLUSION

Varieties of tomato used in the experiment were susceptible to Fusarium wilt pathogen with varying degrees of susceptibility. Sokoto local variety experienced more profound infection. Therefore, more control measures should be employed in the production of these tomato varieties, especially the more vulnerable ones.

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