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EFFECTS OF FUNGIC TREATMENTS IN THE DISEASES CONTROL OF TOMATO (*LYCOPERSICUM ESCULENTUM* L.) DURING THE RAINY SEASON - A CASE STUDY OF NKOLO/ MVUAZI (DR.CONGO)

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ABSTRACT

Tomato (*Lycopersicum esculentum* L.) is one of the crops most widespread throughout the world, but it is very sensitive to the attacks of the cryptogamic diseases due to the excess of moisture of ground. The use of the synthetic pesticides is an effective means to control the diseases which fight this crop in order to avoid significant losses of yield fruits. This work was led in Nkolo (Kongo Central province) in Democratic Republic of Congo, in order to identify the better fungicides used by the peasants face the extent of the diseases which reigns in the medium, and to determine their best frequency of pulverization. Led according to the experimental device in Split stud design with 3 repetitions, two factors selected to know the type of fungicide (principal factor) and the frequency of pulverization (secondary factor) were retained for the experimentation covering of 4,81 ares of area..

The results show that:

- The diameter of the fruits was not influence by various fungicides and frequencies of pulverization,
- he number of fruits produced by plant was a function either of the growth of plant, or of the time of harvest,
- The mixture of fungicides Callomil plus + Ivory 80 had given the highest rotted fruit yield,
- The majorities of fungicides are generally under or high proportioned by the truck farmers. All fungicides had statistically expressed a good performance by taking account of the output and the incidence and severity of the mildew, although the highest yield was obtained with Fongizeb fungicide,
- The frequency of pulverization once after two weeks had proven to be the most favourable from an economic standpoint moment compared to the frequency of pulverization after one week and that after the rain.

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INTRODUCTION

The tomato (*Lycopersicum esculentum*) is one of the crops most widespread throughout the world. It is a significant source of vitamins as well as a crop of significant revenue for the small farmers and the commercial farmers who have an average exploitation (Naika, 2005). The tomato became one of vegetables most significant of the world. In 2001, the world production D tomato was approximately 105 million tons of fruits on a surface evaluated to 3.9 million hectares (Naika, 2005). The majority of the countries characterized by a hot and wet climate, are often confronted with the multiple problems of attacks of the cryptogamic diseases which had by the excess of moisture in the ground (Naika, 2005). Currently in several countries, the production with large or of tomato, would be difficult if not impossible to realize without chemical protection (Nsuadi, 2011). The tomato is one of the market garden crop become a predilection crop in Nkolo in general and Mvuazi in particular, but it is mainly subjugated with the attacks of the diseases, in fact the mildew, which very strongly reduces the fruit yield. According to the importance of the symptoms, the losses of output can have various levels; others

losses can be brutal with reductions in the outputs, while others can be moderate. The prevention of the diseases is extremely significant for the crop of tomato. Practically, all the diseases are repressed adequately by the application of the chemical synthetic pesticides. However, the majority of the pesticides cost expensive and sometimes are very harmful for the human beings like for the environment, thus their use should be limited to the emergency cases (Naika, 2005). It proves however that the majority of the small producers of tomato does not master or are unaware of the regulation in force about the use of the synthetic pesticides. Sometimes, the products under-are proportioned, which constitutes a substantial financial loss related to the purchase of the product and having for consequence, the exposure of the crop to the attacks of the diseases and the reduction in yield. Sometimes, the products are over dosage, which once more represents a financial loss drawing the intoxication of the crops and a reduction of yield. The truck farmers of Nkoloarea are not saved by this ignorance of the regulation on the use of the synthetic pesticides. Thus, this study was led in order to bring to the truck farmers of the adequate solutions to the problems involved in the use of these chemical pesticides. To conclude this study, we resorted to an exploratory investigation and a practical experimentation on ground.

The had aims are

- To inform itself on the various current amounts used by the local truck farmers of Nkolo;
- To identify the cryptogamic diseases which prevail in the region of Nkolo and surroundings;
- To identify best fungicides, available on the market of Nkolo, according to the amounts recommended by the manufacturers;
- And, to determine the best frequency of pulverization of these fungicides identified on tomato.

In own way of assumption, this study supposes to identify le(s) better fungicides in the batch of the products inventoried on the local market as well as the determination of the ideal frequency of treatment.

MATERIALS AND METHODS

Description of the medium

Site of the trial: This study was led on ground to the Research Center of INERA in Mvuazi.This center is in the Grouping of Nkolo, Sector of Boko, Territory of Mbanza-Ngungu, single Division of Cataracts, Province of Kongo Central, in Dr. Congo. The Research Center of Mvuazi is at the geographical co-ordinates of 14°54' Longitude East and 5°27' Southern Latitude and at 470 m of altitude (Crabbe, 1978).

Experimental period: The study was led during the farming season 2011-2012, Solarenergy of November 3, in 2011 to February 25, in 2012.

Climatic conditions: The Center of Mvuazi is located on a valley, in tropical zone with climate hot and wet of type AW4 according to the classification of KOPPEN and characterized by two quite distinct seasons:

- The dry season, particularly marked by its extension, is divided into two:longest begins in May and is completed in mid-October, while shortest February and January covers;
- The rain season which extends from October until mid-May, with a small interruption in January and mid-February, has two maximum precipitations being between March-April and November-December.

Annual average of the rainy season is 1,375 mm, and during the rainy season, the average temperature of the day varies from 21.5 to 23.5°C (PRONAM, 1979).

Edaphic conditions: The site of Mvuazi is consisted grounds including a complex alluvio-colluvionnaire which extends on all the series from the young and old grounds partially washed. The alluvia include/understand the clay-sand and sand-argillaceous types which are out of liable to deterioration minerals. The grounds of this series are associated a flat relief (Lumbu, 1993). The trial was installed in the valley of Nkokozi, on a ground with clay-sand ground which fulfills the requirements of the tomato crop well.

Materials used

Human and seeds materials: Within the framework of our investigations, we resorted firstly to an exploratory investigation in the region of Nkolo, then with an itself experimentation into ground. This exploratory investigation had been directed towards a sample of 10 truck farmers randomly selected and had as principal goals of:

- To identify various fungicides available in the market of Nkolo;
- To have the knowledge of various methods used (amounts and frequencies of pulverization) by the truck farmers of Nkolo in report/ratio to the use of various fungicides;
- To have the knowledge of various diseases of tomato which prevail in the medium;
- To have the knowledge of various farming techniques used for the tomato crop in the medium.
- The experimentation properly-known as on ground had as an objective essential to check the information collected during the exploratory investigation. Thus like vegetable material, we had used the imported seeds of the improved variety "Caraïbo".

Mineral manure: All the pieces were fertilized using mineral manure NPK 17-17-17, with the amount of 5 g/plant, corresponding to the amount of 200 Kg/ha. Manure was applied in localization, to 10 cm beside each foot. Manure was applied twice, that is to say at two weeks after transplantation and the beginning of the fruit formation.

Fungicides materials: An investigation had been initiated in order to identify the nature of all the fungicides sold at the local market of Nkolo. Various inventoried fungicides are announced in Table 2. On the basis of chemical composition in term of active matters, 5 fungicides had been selected for the experimentation, and Ivoiry 80 and Callomilplus had been used in mixture.

Tools and others equipments: The following tools and equipment were used:

- Short machete, hoe and rake, for the preparation of the ground and of maintenance of the pieces;
- Twist and ribbon for the delimitation of the ground;

Table 1. Climatic conditions during the experimental period

Month	Rainfall		Temperatures			Relative humidity (%)	Total of cosmic radiation (Cal/m ²/ J)
	Height(mm)	No. of day of rain	Max	Min	Average		
November	347.6	11	29.2	20.5	24.8	78.8	536.3
December	167.0	8	28.5	20.9	24.7	82.4	422.0
January	4.8	-	29.0	19.5	24.2	78.4	476.7
February	63.0	6	30.6	19.8	25.2	73.6	545.2
TOTAL	-	25	-	-	-	-	1,980.2
AVERAGE	145.6	-	29.18	20.18	24.73	78.3	495.05

Source: GCRN Antenna, Mvuazi, 2012

Table 2. List the fungicides inventoried at the market of Nkolo

Fungicide	Formulation		Composition	Recommended proportion	
Ivory 80 *	Moistern(wp)	powder	800 g/Kg of Mancozebe	60-85g/15liters	
Callomil plus *	-		1 kg contains 120 g of Metalaxyl + 600 g of copper (xide)	50 water g/15	liters
Super Fongizeb *	-		Mancozebe + 80 g/Kg of Metalaxyl	25 g/16 liters	of water
Super Mancozan	Moistern (wp)	powder	640 g/Kg + Metalaxyl 80 g/kg	2 Kg/Ha	
Mancozan	-		Mancozebe 750 g/Kg	2 Kg/Ha	
Mancozan super *	-		550 g of Chlorothalomil+ 100 g/litreof Carbendazine	50-75 ml/15 liters of water	
Ridomil Gold plus *	Mostern (wp)	powder	60 g of Metalaxyl - M and 600 g of copper in the form of Copper oxide	water 50g/15	liters
Nordox 75 wg	-		Copper 75% (CuO_2)	40 g/15 liters of water	

(*):Fungicides retained for the experimentation.

- Pulverizer and watering-can, for the pulverization of fungicides, and watering;
- Slat, slide caliper and balances precision for the catch of the data and proportioning;
- Gloves, mask and impermeable for the protection of the body.

METHODS

Installation of the trial: The farming techniques had consisted with the installation one to seed bed, with the clearing, the surface manual ploughing, with the staking, tracing and modelling of the plat bands, with road repair, the amendment with manure and several sarclo-hoeings, with manual waterings, fungic pulverizations, staking, the egourmandage, then finally with the harvest of the ripe fruits. All the seedlings were mended with the spacings of 0,50 m in all directions. Fungicides were applied to the amounts (average between minima and maximum) and quantities of water recommended by the manufacturers, and are consigned in table 3. The first pulverization of fungicides had taken place one week after road repair. The quantities of water and the quantities of fungicides had been increased gradually according to the stages of development of the plants (increase in the biomass) during the growth. The data are represented in Table 4.

***Experimental factors and treatments*:** On the basis of problems which had initiated this study (see Introduction), two factors had been retained within the framework of our experimentation.We quote the type of fungicide (principal factor) and the frequency of pulverization (secondary factor).The amounts used for each fungicide were those recommended by the manufacturer.

Device and experimental plan: The experimental device used was that of Split-plot design, with 3 repetitions. Each repetition had 18 pieces of which each one occupied a surface of 6.25 m^2. The pieces were spaced of 0.50 m. Each block had 17.5 m of length and 8.5 m of width, and were separated by an alley of 1 m.

The elementary pieces of 2.5 m x 2.5 m were separate on both sides by alleys of 0.50 m width. Each repetition had 18 pieces of which each one occupied a surface of 0.25m^2. The trial properly-known was 27.5 m, length on 17.5 m of width, thus covering a total surface of 481 m^2 (4.81 ares).

Sampling: All the 25 seedlings of the elementary piece and the 9 seedlings resulting from the central lines had constituted our sample of work according to parameters' observed.

Observed parameters: The rate of resumption of the seedlings :consist with the evaluation of the number of seedlings having begun again a few days after transplantation of comparison with the total number of mended seedlings, following the following expression:

$$Rate\ of\ recovery = \frac{Total\,number - taken\,again\,seedlings}{Total\,number\,of - sown\,seedlings} x100$$

- The height of the seedlings (in cm):represent the size of the seedlings measured starting from the collet to the apex.
- The diameter of the fruits (in cm):the size or the gauge of the fruits had been evaluated with harvest using a slide caliper.
- The total number of the fruits collected by seedling (NTFR):consist with the counting of the number of fruits carried by the plant, with harvest. This parameter had been evaluated for 3 successive harvests (NTFR1, NTFR2, NTFR3).
- Evaluation of the diseases: On the basis of scale of quotation going from 1 to 5, the various diseases (mildew and rots of the fruits) recorded had been evaluated, mainly the mildew and the rots of the fruits.

Scale of quotation for the mildew:

- No symptoms
- Beginning of the symptoms
- Light symptoms
- Attack partial of the plant
- Total attack of the plant

Table 3. Amounts used in report/ratio with the recommendations of the manufacturers

Fungicides	Quantity of fungicide	Quantity of water
Ivory 80	73 g	15 liters
Callomil plus	50 g	15 liters
Banco plus	25 g	15 liters
Fongizeb plus	63 ml	15 liters
Nordox	40 g	15 liters
Ivory 80 + Callomil plus	62 g	15 liters

Table 4. Quantities of fungicides and water used

Fongicides	Seedling stage		Vegetative stage		Maturity stage	
	Quantity of water	Quantity of fongicide	Quantity of water	Quantity of fongicide	Quantity of water	Quantity of fongicide
Ivory 80	2 liters	10 g	3 liters	15 g	4 liters	20 g
Callomil plus	2 liters	7 g	3 liters	10 g	4 liters	14 g
Fongizeb super	2 liters	3 g	3 liters	5 g	4 liters	6 g
Banco plus	2 liters	8 ml	3 liters	13 mg	4 liters	16 ml
Nordox	2 liters	5 g	3 liters	8 g	4 liters	10 g
Ivory 80 + Callomil plus	2 liters	8 g	3 liters	12 g	4 liters	16 g

Table 5. List of treatments

Treatments	Fungicide	Shortening
Principal factor	Ivory 80	Fo 1
	Callomil plus	Fo 2
	Banco plus	Fo 3
	Fongizeb plus	Fo 4
	Nordox	Fo 5
	Ivory 80 + Callomil plus	Fo 6
Secondary factor	After 1 week	Fr 1
	After 2 weeks	Fr 2
	After each rain	Fr 3

Tableau 6. Evaluation of different agronomic parameters

Treatments	D(cm)	HP (cm)	NTFP	NTFR1	NTFR2	NTFR3	NTFR	PTFP1 (gr)	PTFP2 (gr)	PTFP3 (gr)	PTFP(gr)	Rdt1 (T/Ha)	Rdt2 (T/Ha)	Rdt3(T/Ha)	Rdt(T/Ha)
Fongicides															
Ivory 80	4,48a	23,46a	1,33ab	3,22a	4,55a	7,44b	15,22a	704ab	1201,3a	1317,3a	3222,60a	1,1ab	1,9a	2,1a	1,70a
Callomil plus	4,46a	23,79a	0,55ab	2a	6,33a	9,55ab	17,88a	586,44ab	1403,6a	1518,4a	3508,44a	0,9ab	2,2a	2,4a	1,83a
Fongizeb	5,13a	25,03a	1,55ab	2a	9a	8,22ab	19,22a	887,56a	1690,3a	1442,6a	4020,46a	1,4a	2,7a	2,3a	2,13a
Banco plus	4,72a	21,23a	1,66ab	1,88a	6,22a	11,88a	20a	325,56b	1074,6a	1510a	2910,16a	0,5b	1,7a	2,4a	1,53a
Nordox	4,63a	24,3a	2a	2a	9,22a	8,22ab	19,44a	411,56ab	1665,4a	1367a	3443,96a	0,6ab	2,6a	2,1a	1,77a
Callomil + Ivory 80	5a	21,32a	0,11b	2,22a	8a	9,77ab	20a	557,44ab	1390,9a	1960,8a	3909,14a	0,8ab	2,2a	3,1a	2,03a
Frequencies															
After 1 week	4,81a	22,81a	1,38a	1,55a	7,11a	7,66b	16,33b	428,94a	1445,2a	1455,3a	3329,44a	0,6a	2,3a	2,3a	1,73a
After 2weeks	4,76a	25,07a	0,94a	3,22a	7,38a	11a	21,61a	736,11a	1402,6a	1619,2a	3757,91a	1,1a	2,2a	2,5a	1,93a
After each rain	4,64a	21,68a	1,27a	1,88a	7,16a	8,88ab	17,94ab	571,22a	1365,3a	1483,5a	3420,02a	0,9a	2,1a	2,3a	1,77a
Average	4,74	23,19	1,2	2,22	7,22a	9,18	18,63	578,76	1404,4	1519,4	3502,46	0,9	2,2	2,4	5,6
PPDS(.05) Fungicide	1,35ns	4,39ns	1,72ns	3,41ns	5,74ns	3,84ns	7,63ns	532,98ns	675,78ns	767,24ns	767,24ns	0,8ns	1ns	1,2ns	2,1ns
PPDS(.05) Frequency	0,71ns	3,54ns	0,83ns	2,17ns	2,6ns	2,75ns	4,95ns	360,12ns	518,01ns	268,33ns	268,33ns	0,5ns	0,8ns	0,4ns	1ns
CV(%)	21,79ns	22,22	100,8	142,3	52,52	43,62	38,68	90,44	53,62	25,67	0,00	90,44	53,62	25,67	26,58

Legend: D:Diameter of the fruits; HP: Height of the seedlings; NTFP: Total numbers rotted fruits; NTFR1:Numbers total fruits harvested/1st collects;NTFR2:Numbers total fruits harvested/2nd harvest;NTFR3:Numbers total fruits harvested/3rd harvest; NTFR: Total numbers fruits collected; PTFP1: Total weight of the fruits collected by plot/1stcollects; PTFP2: Total weight of the fruits collected by plot/2nd harvest; PTFP3:Total weight of the fruits collected by plot/3rd harvest; PTFP: Total weight of the collected fruits; Yield 1: average of yield/1th collects; Yield2: average yield/2nd harvest; Yield3: average yield/3rd harvest; Yield: average yield/has, ab,b: The averages with different indices are significantly different; NS:non-significant differences.

The evaluation of the mildew had been carried out to 8, 9, 10 and 11 weeks after road repair (werr.). NTFP: Numbers total rotted fruits. The total weight of the fruits by piece (PTFP-grams):represent the total quantity of the fruits collected by piece. This parameter had been evaluated for 3 successive harvests (PTFR1, PTFR2, PTFR3). The yield (Rdt-Tonnes/ha): represent the weight of the fruits obtained by piece (PTFP), extrapolated with the hectare. This parameter had been evaluated for 3 successive harvests (R1, R2, R3) (R1, R2, R3).3 successive harvests had been carried out to 9, 10 and 11 weeks after road repair.

RESULTS

The trial was carried out in statistical device of Split-plot design, with three replications. The data collected of the investigation and the experimentation were arranged using the Excel software and were analyzed by using the software Statistix 8.0. The results so obtained are presented in the tables and figures below:

Exploratory investigation

The summary results obtained of the answers of the 10 truck farmers are summarized as follows:

- The crop of tomato seems to be profitable,
- Caribbean is the variety most used in the region of Nkolo,
- The symptoms of the diseases relate to especially the yellowing and the withering of the sheets, the rots and the fall of the young fruits, the circular spots with concentric circles and of many black spots. These symptoms observed by the truck farmers return clearly to the mildew of tomato.

However, the ideal would be to examine some samples at the laboratory for confirmation. According to the order of importance, The majority of the truck farmers use following fungicides: Ivory 80,RidomilGold plus,Callomilplus, super Fongizeb, Sicomiland Mancozan super. In the case of species of IVORY 80, the amounts used in term of ' limp of tomatoes " (standard), vary between 1-2 limp, which corresponds to 30-60g.Wenote that this amount is slightly weak compared tothe recommendations of the manufacturer who requires 2 -3 limps (Refer. Tableau 3). In addition, the majority of the truck farmers apply fungicides after 1 week.

Observed results: The results obtained of the experimentation to the field are presented in the tables and figures.

Table 6: Above reveals the following conclusions:

- The diameter of the fruits is not influenced any more by various fungicides and frequency of pulverization of those. This parameter could be genetic i.e., related to the variety or related to the level of fertility of the ground. It is the same for the height for the seedlings.
- In term of rots of the fruits by plant, the mixture of Callomilplus fungicides and Ivory 80 gave the best result with 0.11 fruits rotted by plant while Nordox fungicide gave an average of 2 fruits rotted by plant, when well even in a total way; there no were significant differences between treatments. Generally, we note that under the experimental agro-ecological conditions which were ours, the level of the rots was very low for the whole of fungicides used, i.e. 5.26% of average incidence.
- The number of fruits per plant neither is influenced by the types of fungicides noT by the frequencies of pulverization. This number is for as much function of the growth of the plant is time of harvest. The first harvest (2.22 fruits/plant) gave the lowest level while two last harvests (7.22 and 9.18) gave the best performance.
- Compared to the output, all fungicides which expressed the same performance statistically, when well even they are fungicides Fongizeb and Callomilplus + Ivory 80 which numerically gave the highest outputs (2.13 and 2.03 T/ha) while Banco plus fungicide more gave the weakest output (1.53 T/ha).
- Compared to the frequencies of pulverization, no statistical difference was found. But for economic and practical reasons, it is the frequency "after 2 weeks" which proved to be most favourable of the moment when the exploratory investigation realized had shown that the most used frequency was "after 1 week", which represents a financial loss on behalf of the truck farmers.

Once more (Figure 1), the peaks of the yields (3,1 and 2,7T/ha) were recorded with Fongizeb and Callomylplus +Ivory 80. Ivory 80 which represents the fungicide more used in the region of Nkolo (withan amount weaker than that of the manufacturer) is badly comprised during the 2 most profitable harvests. Generally (Figure 2), all fungicides expressed the same tendency compared to the yield, i.e. a first collect very weak (0.9 T/ha), followed by the second harvest and third collects very high (2.2 and 2.4 T/ha). Last harvest was only made up of waste.

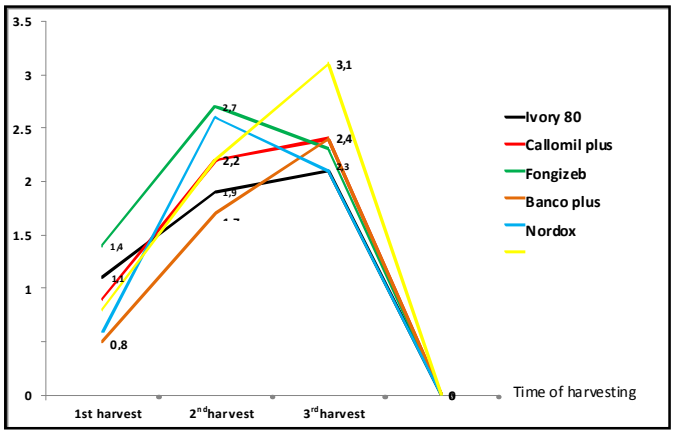

Figure 1. Performance of various fungicides compared to various harvests

There is indeed a significant statistical difference between fungicides (Figure 3). Callomil plus + Ivory 80 gave the best result (31.6%). With regard to severity, fungicides Callomilplus + Ivory 80 and Ivory 80 gave the best result (Figure 4). We note that the affected mildew the tomato seedlings as of road repair, but becomes more extensive a few weeks before the first harvest (9 werr.) (Figure 5).The differences between periods of observation being significant for the incidence as well as severity, we note that no fungicide had been able the mildew completely.

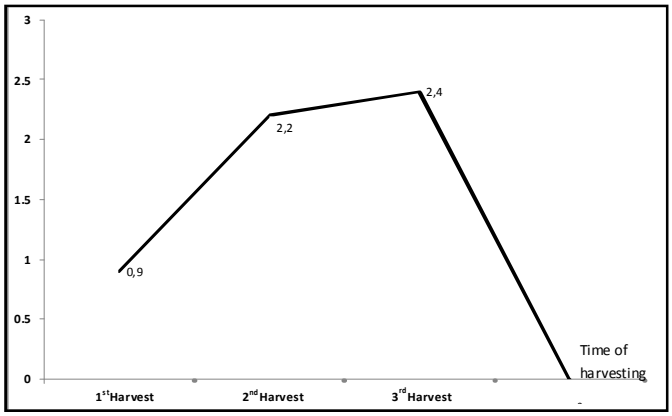

Figure 2. Evolution of the output of the whole of fungicides compared to various harvests

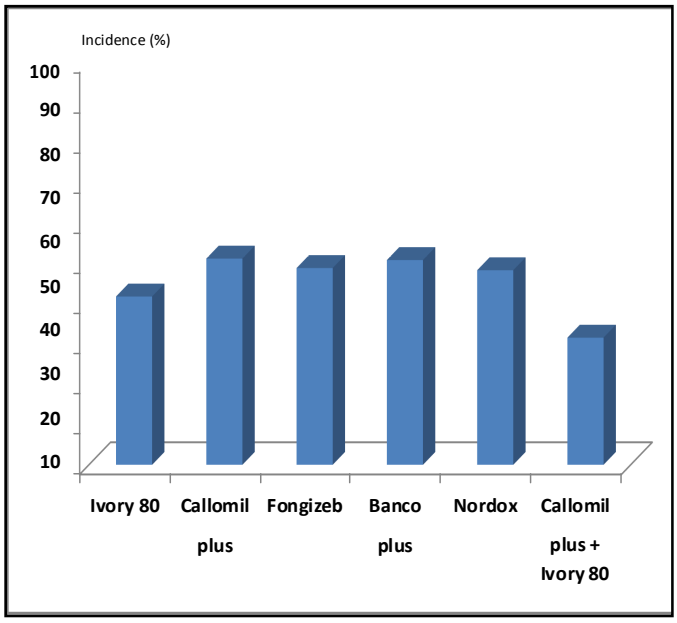

Figure 3. Effects of various fungicides on the incidence of the mildew

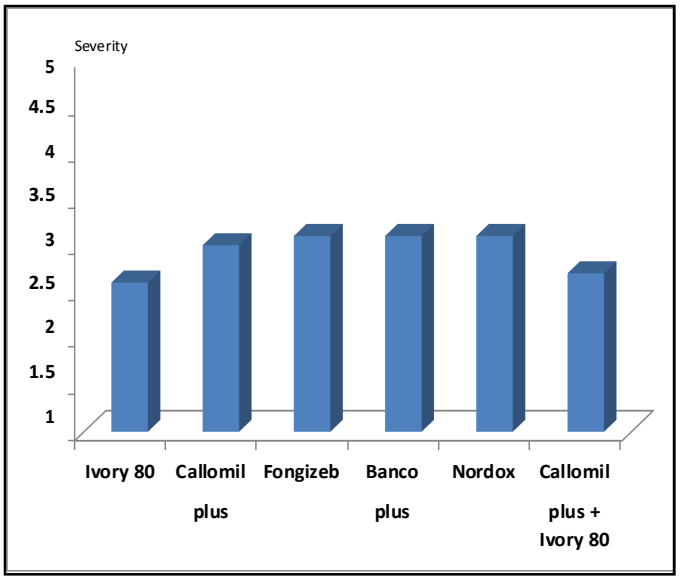

Figure 4. Effect of various fungicides on the severity of the mildew

The symptoms of the disease tended to evolve with time from 8 sar (weeks after road repair).

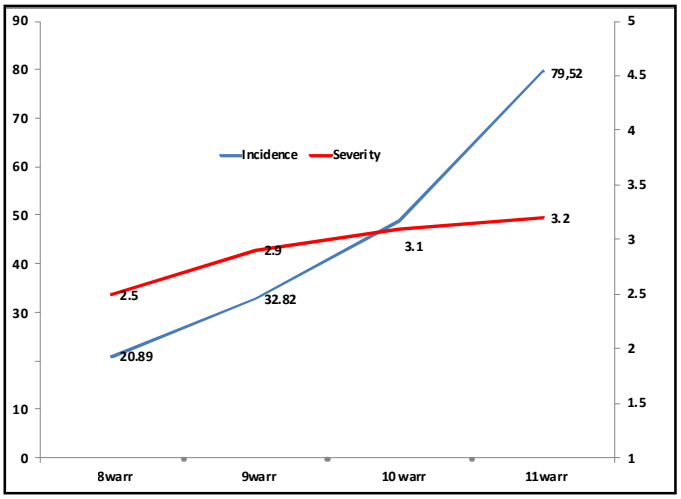

Figure 5. Evolution of the incidence and the severity of the mildew compared to time

DISCUSSION

The population of Nkolo and her surroundings grant an interest to the vegetables fruits, of which the tomato. Muliele *et al.*(2017a) attest that the market garden crops have a cycle runs, are easy to practice and constitute a profitable investment in the short run, because they can be marketed directly after harvest without any preliminary transformation...In addition, the systematic use of the pesticides of synthesis to optimize the outputs in the market garden crops was reported in several other African countries, in particular with Benign, Ivory-Coast, Ghana, Senegal and Togo (Assogba-Komlan *et al.* (2007), Sounganbe *et al.* (2010), Ahouangninou (2013), Kanda *et al.(*2013), Wade (2013), Mawussi *et al.* (2015) and Mondedji *et al.*.(2015). These authors also reported an inadequate use of the pesticides, in particular with regard to the proportioning and the application of fungicide during the treatment. Their results corroborate those obtained within the framework of this research. Indeed, the truck farmers of Nkolo and its surroundings in general use the pesticides and fungicides in particular, without referring to the amounts recommended by the manufacturers. Some truck farmers surveyed use the mixture of more than one product for lack of the master and are unaware of also the regulation in force about the use of the synthetic pesticides.

In the case of species of fungicide Ivory 80, the amounts used in term of limps of tomato like standard, vary between 1-2 limp, which corresponds to 30-60 g. We note that this amount is slightly weak compared to the recommendations of the manufacturer, who requires 2-3 limps of tomato (see table 3). The application of fungicides for the majority of the truck farmers is made after one week, that there is rain or not. That indicates a financial loss related to the purchase of the product. Muliele (2017b) confirms on this subject that the truck farmers is not protected adequately during the plant health treatment, pollute the environment (alive water, air, ground and other beings), do not have a master amounts to apply and they seldom apply the amount recommended. They thus do not have a good knowledge of the pesticides. The pesticides are a weapon with double edge and as much they have an undeniable utility, as much they can generate disastrous consequences for human, animal health and the environment. if the conditions of formulation, transport, storage and use are not observed (Congo (2013); Ghorbel *et al.* (2016); Muliele

(2017b)).According to our results obtained, the application of the product after two weeks was more profitable for a good economy and to avoid the resistance of the diseases and insect pests to the crop of tomato. However, as shows it by Muliele *et al.* (2017b), the majority of the local truck farmers are supplied locally but none the holders of dispensaries of sale of the pesticides has an expert formation on the pesticides to frame them...To this end, an urgent need for formation and sensitizing of the truck farmers must be associated the rational use of the pesticides...Lastly, in order to reduce the negative incidence of the chemical pesticides of synthesis, the use of the biopesticides, produced relatively less toxic and respectful of the environment can be an adequate alternative (Muliele *et al.*(2017b) and interesting results of the biopesticides were brought back in several areas of market garden crops of the world (Deravel *et al*. (2014); Mondedji *et al*.(2015); Bhagwan and Kumar (2017); Patel and Kumar (2017)). For the zone of study, much of efforts must also be provided on this subject insofar as according to Muliele *et al.* (2017b), only one truck farmer on the 46 surveyed in their study would have tested a biopesticide.

Conclusion

At the end of this work which had as a principal objective, the determination of best fungicide for the crop of tomato in the region of Nkolo, the projecting results are summarized as follows:

- The mildew represents the principal constraint of the crop of tomato in the region of Nkolo,
- The majority of fungicides under - proportioned or on - are sometimes proportioned but for economic reasons, the products under - are generally proportioned, thus exposing the crops to the attacks of the mildew,
- With the resulting one from the experimentation, all fungicides used were not statistically different nevertheless, by combining the aspect yield and of the incidence and severity of the mildew, fungicide Callomilplus + Ivory 80 seems to numerically give the best result followed by Fongizebfungicide,
- The pulverizations carried out once after two weeks, seem to give the best result (the from an economic standpoint).
- To answer the starting assumption, we supposed to have achieved the goals assigned by identifying two fungicides which seem to give good results and wish that the study be repeated for the confirmation of the results obtained.
- Considering the various misdeeds recognized with chemical fungicides, we suggest that research of scale is undertaken in report/ratio to the biofongicides or natural fungicides.
- This is why we recommend to adopt the strategies of integrated fight (Integrated Pest Management or " English IPM ") which combine the utilization of the resistants/tolerant varieties, practices of the suitable crops and the rational application of the pesticides by stressing the biological pesticides.

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