Field Evaluation of New Fungicide, Etisa 80 WP for Management of Tomato Late Blight (*Phytophthora infestans* (Mont) de Bary) in Rift valley of, Ethiopia

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Abstract

Tomato (Lycopersicon esculentum Mill.) is one of the most important vegetables worldwide. World tomato production in 2014 was about 125 million tons of fresh fruit from an estimated 4.1 million ha (FAOSTAT, 2011). Among vegetables crop grown in Ethiopia tomato ranks first both in area coverage and yield per acre.

The experiment was conducted at Adami Tulu Agricultural Research Center during off season (November 2015 – March, 2016), to evaluate the efficacy of fungicide with trade name of Etisa 80% WP and common name Mancozeb with the active ingredient content of Mancozeb 800g/kg WP for controlling tomato late blight caused by Phytophthora infestans

Significantly highest (80%) Phytophthora infestans severity score was observed on untreated pots while significantly lowest (26.6 - 28.3) severity score was recorded in all fungicide treated plots. The minimum disease severity score (26.6%) was obtained from plot treated with Sabozeb 80% WP (Standard check) at 2.5 kg ha^{-1}. The result showed no significant difference between Sabozeb 80% WP and Etisa 80% WP.

Significantly, highest (228 ha^{-1}) weight of marketable tomato yield was obtained from plots treated with Etisa 80% WP at rate of 2.5kg ha^{-1} followed by Sabozeb 80% WP (220.7) at the same rate. The result of the two indicated non-significant difference with in the treatments. However, significantly lowest (93 q ha^{-1}) yield was obtained from untreated plots.. Based on the results of the this location test carried out in rift valley, Ethiopia on the effectiveness of the test fungicide, Etisa 80% WP, and consideration of the wide range of late blight disease in tomato controlled, the use of Etisa 80% WP by the farming community (both individually and or private sector) will no doubt improve tomato production in Rift Valley as well as in similar agro-ecology.

Key wards: Etisa, Tomato, Late blght, Saboze and disease

I. Introduction

Tomato (*Lycopersicon esculentum* Mill.) is one of the most important vegetables worldwide. World tomato production in 2014 was about 125 million tons of fresh fruit from an estimated 4.1 million ha (FAOSTAT, 2011). Among vegetables crop grown in Ethiopia tomato ranks first both in area coverage and yield per acre. The farmers prefers to produce tomato because it is a relatively short duration crop and gives a high yield, it is economically attractive as aresult the area under cultivation is increasing from time to time. Tomato belongs to the *Solanaceae* family (Mutitu et al., 2008). This family also includes other well-known species, such as potato, tobacco, peppers and egg- plant (aubergine).

Production and productivity of tomato is constrained by several factors, among which late blight disease caused by *Phytophthora infestans* play significant role in tomato production worldwide. In Dugda, Bora in particular and in tomato producing area of Ethiopia in general *Phytophthora infestans* can cause up to 100% loss. A 30% severity of Phytophthora *infestans* can reduce yield by 53% and number of marketable tomato by 19% (Hausbeck, 2005). *Phytophthora infestans*, a fungus that overwinters on tomato debris in the field, affect tomato prior to transplanting. Infection often follows injury caused either by other fungi, or by sand, windstorms or during watering. Older leaves are more susceptible. Spores require rain or persistent dew to cause infection. Optimum temperatures are 22- 29°C.

Tomato fruit may decay during and after harvest. Decay shows first as a watery rot around the neck and is particularly noticeable because of the yellowish to wine-red discoloration in the neck region. As the fungus moves through tomato fruit, the tissue turns black then a wine-red and dries to a papery texture (Pscheidt, and Ocamb, 2012).

Most of the tomato varieties grown by the farmers of Rift Valley are susceptible to the disease and causing significant loss particularly where the climates favor the disease development. The need of relatively safe, protectant, multi site action fungicide is very crucial for the management of tomato late bligt to restore the yield and quality losses for small scale farmers and investors as well to produce health and quality fruit yields. Therefore, Adami Tulu Agricultural Research Center in collaboration with EGAA Agricultural Input Supplier PLC has agreed to test the efficacy of fungicide with trade name Etisa 80% WP and Common Name Mancozeb in 2015/16 off season with the following objective

Objective

To evaluate the efficacy of Etisa 80% WP (fungicide) for management of tomato late blight caused by *Phytophthora infestans*

II. Materials and Methods

The experiment was conducted at Adami Tulu Agricultural Research Center during off season (November 2015 – March, 2016), to evaluate the efficacy of fungicide with trade name of Etisa

80% WP and common name Mancozeb with the active ingredient content of Mancozeb 800g/kg WP for controlling tomato late blight caused by *Phytophthora infestans.* One rate of Etisa 80% WP at 2.5kg/ha, Sabozeb (standard check) at the rate of 2.5kg/ha and untreated check were used as a positive and negative control, respectively. Tomato was planted on 10 m x10 m, with row and plant spacing of 0.75m x 0.3 m, respectively. This experiment was designed as randomized complete block design in three replications. For this particular study the treatments were sprayed fife times at 7 day intervals.

Fungicides (Etisa 80% WP and Sabozeb 80% WP) were foliar sprayed with knapsack sprayer in seven (7) days interval from anticipation of the onset of the disease until the crop reached physiological maturity. Untreated plot was also sprayed with equal volume of pure water to reduce variability caused due to moisture difference.

Data collection

Appearance of the disease in the experimental plots was inspected five times every seven days interval. Initial scoring for disease incidence was done when lesions was visible on the basal leaves of the plants. Numbers of plants infected in the four middle rows was recorded and their means was converted into percentage as the total plant observation (gwary *et al*., 1998).

The per cent incidence was calculated as:

$$\text{Disease incidence} = \frac{\text{Number of diseased plants}}{\text{Total number of plants inspected}} \times 100$$

Severity of late blight was recorded on the basis of 1-6 rating scales as described by Gwary and Nahunnaro (13). where scale 1=trace to 20% leaf infection, 2=21-40% leaf infection, 3=41-60% infection, 4=61-80 infection, 5=81-99% infection, 6=100% leaf infection or the entire plant defoliation and then the rating scales were converted into percentage severity index (PSI) for the analysis of disease severity using the following formula:

$$Percentage\,Severity\,Index = \frac{Sum\,of\,Individual\,numerical\,rating}{Total\,Number\,of\,assessed \times Maximum\,score\,in\,scale} \times 100$$

Severity was recorded on twelve randomly tagged plants per plot. It was assessed using the 1-5 standard disease scoring scale recommended by (Cambell and Madden, 1990), where 1 = no symptom and 5 = Abundant lesion on all leaves with most of leave tissue being necrotic. The rating was made at seven days interval starting from onset of the disease. Disease incidence, severity and yield was subjected to analysis of variance (ANOVA) using SAS software 12.1 version for significance test and means of significantly varied treatment were separated using LSD at $P \leq 0.05$.

Assessment of yield data

Data related to yields was recorded from each plot for each treatment. Fruits was considered ready for picking, when 50% of tomato fruits turned yellow or red. Mean yields of fruits was assessed on each plot of four central rows.

Marketable yield (MY) and Non marketable yield (NMY): At harvest, marketable and un-marketable yields (number and fresh weight of the fruits classified as commercial or reject unripe and rotten) was assessed on 10 plants per experimental unit.

Data analysis

Data on disease parameters (disease incidence, disease severity) and yield were subjected to analysis of variance (ANOVA) using Statistical Analysis System (SAS) version 9.2 software. Fisher's protected Least Significant Difference (LSD) values was used to separate differences among treatment means ($P<0.05$) for the field evaluation of tomato late blight disease.

Iv. Results

Analysis of variance revealed significant ($p \leq 0.05$) variation of disease severity, incidence, marketable yield, and unmarketable yield due to fungicide treatment (Table 1).

Significantly highest (80%) *Phytophthora infestans* severity score was observed on untreated pots while significantly lowest (26.6 - 28.3) severity score was recorded in all fungicide treated plots. The minimum disease severity score (26.6%) was obtained from plot treated with Sabozeb 80% WP (Standard check) at 2.5 kg ha^{-1}. The result showed no significant difference between Sabozeb 80% WP and Etisa 80% WP. Similarly, significantly lowest (28.3- 33.3 %) diseases incidence was recorded from plot treated with fungicide while significantly highest (81.6 %) late blight

incidence was recorded from untreated plots. Furthermore, there was no significant difference of late blight incidence and severity between Sabozeb 80% WP (standard check) and Etisa 80 %WP. Foliar spray of Etisa 80 % WP at 2.5 kg ha^{-1} and Sabozeb at 2.5 kg ha^{-1} provide better disease protection by reducing disease severity by 53.3 % and 48.27%, respectively, as compared to untreated plots. (Olanya *et al*. 19) also reported that, with the exception of optimum or scheduled fungicide applications based on favorable weather conditions; the most economical option for disease management is the use of host-plant resistance. The use of cultivars with durable resistance combined with scheduled applications of Protective fungicides has been reported as useful for managing late blight (Singh BP, 1999) as well as other diseases
(Abraham Tadesse 2009). In tropical Africa, the contact fungicide Mancozeb 80% WP was widely used to control late blight Olanya *et al*. [19] This is because of an excellent tomato late blight control and also reasonable and acceptable price to be invested in chemical control. This study provides new possible alternatives for the management of late blight to both small and large scale tomato producers.

Significantly, highest (228 ha^{-1}) weight of marketable tomato yield was obtained from plots treated with Etisa 80% WP at rate of 2.5kg ha^{-1} followed by Sabozeb 80% WP (220.7) at the same rate. The result of the two indicated non-significant difference with in the treatments. However, significantly lowest (93 q ha^{-1}) yield was obtained from untreated plots. Percent of unmarketable yield was also significantly varied due to fungicide application. Significantly, highest (41.3%) unmarketable yield was recorded in untreated plots. There was no significant difference percent of unmarketable tomato yield between Etisa 80% WP and Sabozeb 80% WP (standerd check).

Table 1: Effect of Etisa 80% WP, Sabozeb 80% WP and untreated check on disease severity, incidence, marketable and unmarketable yield of tomato

Treatment	Rate /ha	Disease Incidence%	Disease Severity%	Marketable Yield(quntal/ha)	Unmarketable Yield(qunta/ha)
Etisa 80% WP	2.5 kg	28.3B	28.3B	228A	25B

Sabozeb 80% WP (Standard check)	2.5 kg	33.33B	26.6B	220.7A	20.3B
Control (Untreated)	0	81.6A	80A	93.3B	41.3A
Mean		47.7	45	180.6	28.9
CV (%)		14.40	13.22	16.31	9.89

Means followed by different letters were significantly varied at $p \leq 0.05$ using LSD

V. Conclusion and Recommendation

Tomato production is seriously challenged by late blight disease particularly in Rift valley Ethiopia where the disease is greatly favored by various factor. Effective, protectant, eco-friendly, multi site action type fungicides are important to manage this disease and enhance tomato production.

The result of this study indicated that the new protective fungicide Etisa 80% WP at 2.5kg ha^{-1} has effectively controlled tomato disease (late blight) caused by *Phytophthora infestans* equally with standard broad spectrum fungicide, Sabozeb 80 % WP at the same rate improved yield by 40.9 % and reduce disease severity by 51.7 % compared to untreated plots. Therefore, Etisa 80% WP can be recommended for management of tomato late blight disease at rate of 2.5 kg ha^{-1} at 7 days spray intervals. The frequency of application depends upon the growth stage at which the appearance of disease is anticipated. . Therefore, due to reasonable reduction in disease severity, easy application made Etisa 80% WP superior in controlling tomato late blight. Based on the results of the this location test carried out in rift valley, Ethiopia on the effectiveness of the test fungicide, Etisa 80% WP, and consideration of the wide range of late blight disease in tomato controlled, the use of Etisa 80% WP by the farming community (both individually and or private sector) will no doubt improve tomato production in Rift Valley as well as in similar agro-ecology.

VI. References

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