

Enset Bacterial Wilt Sanitary Control in Gurage Zone

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Introduction

Enset bacterial wilt is the major challenge that thwarts enset production systems in major enset growing regions of Ethiopia. The disease was first reported in 1968 (Dagnachew, 1968). It is very destructive as it kills enset at all growth stages.

Anita et al (1996) confirmed that area allocated to enset production is declining from time to time due to bacterial wilt attack. Currently, many farmers started replacing enset field with cereals. The Gurage Zone is enset-dominant farming system. Enset products such as kocho, bulla and amicho are the most staple dishes in the Zone. However, enset bacterial wilt disease is also a serious problem in the area.

In the past various research attempts were made to screen enset clones against enset bacterial wilt under artificial inoculation by Awasa Agricultural Research Center. In addition, the mechanism of pathogen dissemination, its survival was investigated so far. However, up until now there is no chemical control measure effective to control the disease. In addition,

many researchers are recommending sanitary control measures as a short-term solution to the disease (Dagnachew and Bradbury, 1968; Dereje, 1985; Archido and Mesfin, 1993).

In many parts of the region, enset farmers have their own indigenous knowledge about enset bacterial wilt control practices. They have different perceptions and knowledge about the causes, sources and dissemination mechanisms of the disease. Survey reports indicate that many farmers believe that supernatural power being the most important cause for the disease.

By tradition, some farmers use sanitary control measures such as care of farm tools, fencing to check livestock movements into enset wilt infested field and uprooting and discarding infected enset plant out of the field. Nevertheless, many farmers do not have clear perception about the efficacy of sanitary control measures of enset and as a result, they are not properly applying.

Participatory enset bacterial wilt sanitary control were set out by a multidisciplinary team of researchers from Areka and Awasa Agricultural Research Centers in Gurage Zone, Gumer and Cheha Weredas, in Mugoterara and Adoshinaturchi Pas, where the disease

is more serious than elsewhere in the vicinity of these places. This study was conducted with the objective to understand farmers' attitude about the use of sanitary measures, demonstrate the measures to farmers using participatory training and extension methods and to observe the impact of the disease on the type of clones in the enset field.

Methodology

Participatory enset bacterial wilt sanitary control measures were conducted by a multidisciplinary team of researchers consisting of agricultural economist, pathologist and agronomist from Areka and Awasa Agricultural Research Centers and enset experts of Gurage zone at both Zonal and Wereda level between 1998 and 2001. The study was conducted in two agro-ecologies namely highland and mid-altitude. Gumer and Cheha Weredas were selected from the highland and mid-altitude zones, respectively. From each Wereda one Peasant Association (PA) was selected based on the severity of the disease, accessibility and cooperation of local leaders and as well as farmers.

Initial field assessment was conducted in each Weredas and those PAs severely affected by enset bacterial wilt disease were identified. Mugoterara and Adoshinaturchi PAs were selected from Gumer and Cheha Weredas, respectively following the same criteria of selection applied for Weredas. Before any intervention, baseline information was collected to understand farmers' perception about the causes, dissemination mechanisms

and traditional control measures being followed. About 13 from Adoshinaturchi and 15 from Mugoterara households and PAs were interviewed using semi-structured questionnaire. In addition, group discussions were also made with the all household members, development agents and researchers at village level just to know their perception and knowledge towards the disease.

After initial assessment of the already existing farmers' knowledge, training was given to all household members about the causes, dissemination mechanisms, and cares and procedures to be followed while applying sanitary control measures. During the first few months, farmers were not convinced about the efficacy of the measures assuming that the measures were laborious, less effective and expectation of chemical control measures. However, various efforts were made to convince them to the extent that the researchers themselves doing practical field demonstrations on the selected farmers' field. In addition, through repeated training farmers' expectation about chemical control measures was reduced and strategies were designed with farmers to minimize the problem of labor shortage. Hence, farmers were organized in groups and group formation was done based on their interest. They

established social institutions to penalize any farmer who violate the laws agreed by the community members regarding sanitary control measures applications. For implementation, the village community in each PAs elected four-committee member including the development agent of the PA. The committee consists of chairperson, secretary and two elder members who are assumed influential.

Sanitary Control Procedures

After initial assessment and training farmers on basic procedures, that should be followed by the farmers while applying the measures were demonstrated to farmers systematically. The demonstration included the following aspects:

- Digging pit outside the enset field. Depending on the number of farmers in a group, one common place could be selected. The size of the pit should be 3 m deep and 2 m diameter;
- Preparing Barella (a carrying stuff) from local materials;
- Uprooting infected enset plants from each farmer's field;

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- Chopping large plants into small pieces without contaminating other plants and the uprooted plant should be buried in the prepared hole;
 - Treating uprooting, chopping and leaf removing tools with heat (fire)

After the initial application of the above-mentioned activities, the village committee monitored each farmer's field every week. Whenever any infected onset in the field was observed, it was immediately disposed by the owner of the field. Nevertheless, if the number of infected plants were many, the household head could ask his group members for labor support.

Farmers Knowledge of Enset Bacterial wilt Control

The indigenous knowledge of the farmers on the control of enset bacterial wilt could be classified as sanitary measures and traditional beliefs (Table 1). According to the initial interview and the discussion made with farmers, some farmers practiced sanitary control measures such as care of tools, burning, uprooting and discarding of infected plant and other similar types of measures. However, most of the farmers were not applying the measures strictly and procedurally. Moreover, they have little awareness regarding the efficacy of these measures. In addition to these, measures many farmers have a strong traditional belief, which they think, helps to minimize the disease. Some of them are slaughtering sheep and goat, roasting coffee and chewing chat while praying.

About 100 % of the sample farmers in Mugoterara PA (highland zone) use uprooting and discarding infected plant as a control measure. Care of farm tools such as knife, sickles and others was another important sanitary measures practiced by about 77 % of the farmers in this

PA. Farmers used rotation of enset plant with other crops and fallowing. However, fallowing is mostly done if there is no land shortage. Wrapping infected plant with its leaves is mainly practiced in Adoshinaturchi PA (mid-altitude zone). Farmers in Mugoterara PA also indicated that fencing enset fields to prevent livestock movement is good sanitary control measure.

In addition to the use of sanitary control measures, a significant number of farmers in both PAs practice bone, horn, rubber, etc smoking for their bad smell as a control measure. About 31% of the farmers in the highland believe in du'a- roasting coffee and chewing chat while praying as a control measure. Farmers also believed that fungicide recommended for coffee berry disease like Daconile helps in minimizing the disease.

Table 1. Indigenous farmers' knowledge on the control of enset bacterial wilt in Gurage Zone

Indigenous farmers knowledge	% of sample farmers using the practices	
	Adoshinaturchi (n=14)	Mugoterara (n=13)
A). Sanitary Practices		
 Care of tools	42.9	76.9
 Uprooting and discarding infected plant	21.4	100
 Uprooting and processing of infected plant at early stage of disease symptom	7	-
 Crop rotation and fallowing	14.3	61.5
 Removal of first infected leaves	21.4	-
 Fencing	14.3	46.2
 Burning infected plant before or after uprooting	21.4	23
 Soil burning from where the infected plant uprooted	-	15.4
 Wrapping infected plant with its leaves	42.9	-
 Harvesting infected plant out side the enset field	21.4	-
B) Traditional belief		
 Smoking bone, snake, rubber, porcupine for their bad smell	50	53.8
 Planting fonfo and Gimar	-	61.5
 Use of chemicals like Daconil, garlic juice and urine	14.3	23
 Slaughtering sheep and goat	14.3	23
 Du'a-roasting coffee and chewing chat while praying	14.3	30.8

Farmers' Perception on Causes of the Disease

Many farmers in both study areas associated supernatural power as the cause for the disease. Almost 79 and 36 % of the sample farmers in the adoshinaturchi PA and Mugoterara PA, respectively believed that the disease is due to God punishment in the form of lightening and thunder. Moreover, 29 % of the farmers in Mugoterara PA believed that wind is the cause of the disease while the remaining did not know the cause of the disease (Table 2).

Table 2. Farmers' perception on cause of enset bacterial wilt

Causes of the disease	% of sample farmers	
	Adoshinaturchi (n=14)	Mugoterara (n=13)
Supernatural power	79	36
Insects	7	-
Wind	7	29
Rain	-	7
I do not know	-	21

From Table 2 it can be understood that farmers believed in supernatural power as the most important cause for the disease and the control measures they were practicing are related to this cause.

Almost all farmers in the highland reported that the disease cause more damage during dry season but in the mid-altitude the disease become serious in rainy season. But there were also some other farmers who reported that the disease become more serious when the moon rises locally called chegino rather than dry or rainy seasons. According to the discussion made with farmers' enset clones called yeshirakinke and Kembat in Cheha and Gumer, respectively are reported by them to be tolerant clones against enset bacterial wilt attack. Next to enset bacterial wilt a disease called leaf sheath rot or Ziro and corm rot are important diseases identified in the area. Pests like mole rat and porcupines were mentioned as another constraint damaging enset plant.

Farmers' Perception on Dissemination of the Disease

The results of this study indicated that farmers in both areas have various ideas about enset bacterial wilt dissemination mechanisms (Table 3). About 77% of the farmers in the high land reported that contaminated farm tools and livestock movements inside enset field to be responsible in facilitating disease dissemination from infected plant to the healthy ones.

Table 3. Farmers' perception on enset bacterial wilt dissemination

Perception	% of farmer's response	
	Adoshinaturchi (n=14)	Mugoterara (n=13)
Contaminated farm tools	57	77
Livestock movement in enset field	43	77
Human movement in enset field	7	15
Insect pests like Jassid fly	21	8
Bird "kura" and /or 'lbarafechi	7	62
Flooding	7	-
Wind (causing contact of healthy with infected plant) in enset field	-	39
Harvesting infected plant inside the field	-	8
Chicken /hen/ attack	-	31
Dung	-	8
Human waste	-	8
Pulling infected enset in the farm	-	8
I don't know	14	-

Farmers in the study area also noted that a kind bird called "Kura" or Ibarafech in Guragigna is a serious problem especially in the highland. During dry season since there is water shortage, the bird attacks the pseudostem part of the plant there by facilitating disease dissemination to the healthy plant. Chicken were also creating the same kind of problems and as a result, several farmers were not interested to have chicken in their home.

Farmers were usually interested to apply sanitary control measures when the severity of the disease is lower. As the disease become severe, farmers lose patience and they will stop applying the measures. According to the initial interview, about 79 % of the sample farmers were not believed sanitary measures control enset bacterial wilt attack. They have various reasons for this. Some of the farmers reported that they practiced sanitary control measures in the past with out any extension advice but they found that the measures were not effective. Moreover, some others have little perception about the efficacy of the measures.

Extension Services on Sanitary Control

About 96% of the farmers in the study area reported that they did not get extension advice about sanitary control measures against enset bacterial wilt. Farmers also complained that although enset is the most staple food in the area, attention was not given for this crop. Rather the extension system focuses only on cereals, which are not staple food in the area. Application of sanitary control measures needs strong cooperation among farmers, as the activity requires huge labor, time and energy. In addition, repeated advice is necessary to convince farmers in order to apply the measures. For instance, some farmers believed that the disease occurs in some body's field because of the sin he committed. Because of these, they do not want to help each other. There are farmers who fear future hunger because of uprooting and discarding infected plants especially older ones ready for harvest. This is because usually poor farmers used the infected plant for food. Therefore, strong extension service is necessary to increase farmer's awareness regarding the cause and dissemination

mechanisms and the ultimate effectiveness in reducing insect bacterial wilt of the disease.

Farmers Attitude on Causes and Dissemination of the Disease after Applying Sanitary Measures

As it was noted earlier before application of sanitary control measures on farmers field initial assessment was undertaken using semi-structured interview and group discussion to know their perception about the cause, dissemination mechanisms and traditional measures used to control the disease. In addition, the results of this assessment were presented before.

After repeated training and participatory field demonstration of the measures, farmers were convinced about the causes and dissemination mechanisms of the disease. However, at the initial stage of the training and field demonstration many farmers were reluctant to apply the measures. Nevertheless, later on the majority of the farmers started to apply the measures in-group and believed that the measures were effective. In addition, they understood the scientific causes and

dissemination mechanisms of the disease from the training given.

Although this study was started both in adoshinaturchi and in Mugoterara PAs, after one-year implementation of the project, adoshinaturchi PA was replaced by another similar PA called Yefeterke. This was done because the site was abandoned due to fire outbreak and household members in this PA were lost all their properties together with their enset field. As a result, we were unable to continue the study in this PA. However, on the newly selected PA similar kind of procedure were followed. At the end of the project period, farmers' assessment about the cause, dissemination mechanisms, their adoption decisions and factors influencing adoption of sanitary control measures were recorded on the same village and farmers' field.

The results of the final assessment in Mugoterara PA indicate that about 71% of the farmers reported that careful application of sanitary control measures helps to control enset bacterial wilt attack (Table 4).

Table 4. Farmers' perception on effectiveness of sanitary control and adoption decision in Mugoterara PA

Attributes		N	% of sample farmers
Do you think sanitary control measures were effective	Yes	10	71
	No	4	29
Do you use sanitary control measures at present	Yes	9	64
	No	5	36

From Table 4 it can be said that about 64 % of the farmers adopted sanitary control measures in the study area and many of them were convinced about the effectiveness of the measures. There were also farmers who do not apply the measures strictly because of factors, such as labor shortage, especially for female-headed households. The existence of off-farm employment, i.e., some household heads usually migrates towards town. Hence, in most cases villagers will not cooperate in his field with out his presence even if they knew that the disease might be disseminated to their field.

Generally, the results of the study indicate that strict application of sanitary control measures were found to be effective in controlling enset bacterial wilt especially in Mugoterara PA. Because of its success farmers exchange visit were arranged on this PA from other parts of the region such as Sidama, Gedio and Hadiya Zones and similar type

of study was being carried out in some of these zones. For instance, farmers in Gedio Zone were convinced about the importance of sanitary control measure.

Conclusions and Policy Implications

Participatory enset bacterial wilt sanitary control measures were undertaken on farmers' field by a multidisciplinary team of researchers with the objective to understand farmers' perception about the causes, dissemination mechanisms and indigenous knowledge about enset bacterial wilt control measures. The options for enset bacterial control may include use of resistant/tolerant clones and sanitary and cultural control methods. The use of chemicals is not considered as an option to control enset wilt for various reasons. Previous research results indicated the existence of some enset clones having relatively better tolerant reaction to enset wilt. Deploying this option in conjunction with sanitary and cultural control measures are the only advisable methods at hand believed to reduce its spread.

Early detection and prompt destruction and proper disposal of wilt-infected plants would reduce the chance of disease spread and thereby suppress development of bacterial wilt at acceptable level. All enset farmers at

community level should take actions on regular basis and if this is not done strictly, the infested field will be source of inoculum for that area. Cultural practices such as deep tillage and turning over the soil to expose during dry season prior to planting; proper spacing, spot rotation of infested sites would reduce disease spread.

Generally, strict and procedural application of sanitary control measures through farmers training about the nature, cause, and dissemination mechanisms of enset wilt should be given at all levels in order to reduce the threat of enset wilt in major enset growing areas of the region. In addition, practical field demonstration of sanitary control measures by convincing community members have to be considered in the future as a critical task of agricultural extension service in the region.

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