ISSN: 2157-7471
Journal of Plant Pathology & Microbiology

OPEN ACCESS Freely available online

Research Article

# Community Mobilization and Awareness Creation for the Management of Enset Bacterial Wilt (*Xanthomonas campestris pv. musacearum*) Disease in Essera District, Dawro Zone, Ethiopia

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## ABSTRACT

Enset bacterial wilt was found to be remained the most widely destructive, distributed and severe threat to enset (*Ensete ventricosum*) production in Essera district. To avert this problem, community based integrated enset bacterial wilt management was intervened in Duzi and Gudumu Kebeles of Essera district. In this study, suitable enset bacterial wilt control measures including sanitary control measures, improved cultural practices, disease free enset clones were demonstrated and implemented in an Integrated Demonstrated Manner (IDM). IDM intervention was done through awareness creation trainings of farmers, respective and representative partners on the IDM followed by mass mobilization. Task Force at kebele and district levels were formed, which was played a primary role in mass mobilization and IDM technologies promotions. Enset farming community views on the traditional EBW disease natural behaviors and control measures have been noticeably changed through trainings and practicing packages of IDM. About 85% of farmers in the targeted area were aware and adopted IDM; as a result BW disease problem was reduced to 15% from 45% of incidence and many of farmers were convinced about effectiveness of the IDM through collective action. In addition it was recommended that all farmers in the area should maintain strict and procedural application of IDM on regular basis to reduce EBW infection under low level; subsequent awareness creation trainings of farmers on the exact and practical use of IDM is also very vital approach.

**Keywords:** *Ensete ventricosum*; Community mobilization; Sanitary control; Diseases

## INTRODUCTION

Enset bacterial wilt caused by *Xanthomonas campestris pv. musacearum* is the major constraint in enset-based farming system. A natural epidemic of the disease was reported from the banana cv. Ducasse hybrid in Kaffa province of southwestern part of Ethiopia [1]. Enset bacterial wilt is widely distributed in many enset growing regions of the country and affects the crop at all stages [2]. Area allocated to enset production is declining from time to time due to bacterial wilt attack and many farmers started replacing enset fields with other crops [3].

In earlier works, enset cultivars collected from the Sidama, Guragie, Kembata/Tembaro and Hadiya Zones were screened for resistance/tolerance to Xcm at the Awassa Agricultural Research Center and reported that the cultivars showed varying degree of tolerance to the disease [4,5].

Over the past 10 years, many efforts have been done to control enset bacterial wilt in Ethiopia. Management activities used and promoted country wide included; disinfecting farming and processing tools, uprooting and burning the infected enset plants, keeping fields and surrounding areas free of weeds and volunteer plants (alternative hosts), exposing the soil during dry season prior to planting, proper spacing, avoiding overflow of water from infested to uninfected fields, controlling porcupine, mole rat, and other domestic animals from browsing, use of clean planting materials (suckers or corms), strict control of the movement of planting material from one area to other (developing local quarantine system), rotation of crops, and use of resistant or tolerant landraces.

Enset bacterial wilt control technologies promoted using a mix of top-down extension and participatory approaches. Mixed levels of success in controlling Enset bacterial wilt have been reported

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**Received:** 06-Sep-2022, Manuscript No. JPPM-22-17938; **Editor assigned:** 09-Sep-2022, PreQC No. JPPM-22-17938 (PQ); **Reviewed:** 23-Sep-2022, QC No. JPPM-22-17938; **Revised:** 30-Sep-2022, Manuscript No. JPPM-22-17938 (R); **Published:** 07-Oct-2022, DOI:10.35248/2157-7471.22.13.636.

**Citation:** Mitiku M, Yemataw Z, Dejene T (2022) Community Mobilization and Awareness Creation for the Management of Enset Bacterial Wilt *(Xanthomonas campestris pv. musacearum)* Disease in Essera District, Dawro Zone, Ethiopia. J Plant Pathol Microbiol. 13:636.

in various enset producing areas of Ethiopia. In this study we hypothesized that the partial success in enset bacterial wilt control was mainly due to varying levels of mobilization of stakeholder partnerships, to exploit stakeholders' synergies at local and national levels. The study was conducted in December, 2018 to enhance the implementation of integrated disease management of enset bacterial wilt using awareness creation and community mobilization.

The specific objectives were to;

- Enhance farmers and agricultural experts with the available improved enset bacterial wilt management technologies,
- Demonstrate proven enset bacterial wilt control measures through awareness creation and community mobilization.

## MATERIALS AND METHODS

### Description of the study area

Essera District is located in Dawro zone in South West Ethiopia Peoples' Regional State (SWPR) of Ethiopia. It is one of the eleven district of Dawro zone. Essera District is located at 522, 575 and 584 km from Addis Ababa through Hosanna, Shashemene and Jimma roads respectively. It is located at 6.7-7.020 latitude and 36.7 to 37.10 longitudes, with an elevation ranging from 501 to 2500 m.a.s.l. The annual mean temperature varies from 17.6 to 27.5°C. The rainfall is a bimodal type: the short rainy season is between February and March and the long between May and September. The average annual rainfall varies between 1401-1800 mm.

Methods and steps followed;

**Step 1 stakeholders planning meeting:** Potential stakeholders were identified and planning meeting was held with governmental and other formal and informal institutions at district level in Dawro province of South West Ethiopia. The meeting encompasses district and local government authorities, Southern Agricultural Research Institute (SARI), Areka Agricultural Research Center researchers, school directors, extension staffs and model farmers.

Participants were discussed about the problem and its potential impact and set common objective and shares respective roles and responsibilities.

**Step 2 base line surveys:** Pre and post intervention base line information was collected to understand farming community's perception towards the EBW behavior, causal agent, means of dissemination and traditional knowledge to control the EBW disease. In order to substantiate the results of a systematic survey was carried out using structured questionnaire directed on randomly selected of 20 households in the study area. Based on enset production potential, the data on disease incidence and severity, type of enset clones and their reaction to BW were also collected from randomly selected out of the representative households. Disease incidence was considered as the number of infected enset fields divided by the total number of assessed farms.

**Step 3 training:** In general at enset farming community level there was inadequate information on the EBW disease causal agent, transmission mechanisms, and misunderstandings of the effective's management practices. With these regards, awareness creation trainings have been given to key partners about the EBW disease towards control measures.

In addition packages of IDM practices was prepared and has been given to trainees as a procedures and cares to be pursued while collective action intervention takes place at district and Kebele levels.

**Step 4 task force formations and by-law set up:** Task force (TF) was formed at kebele and district levels, to enhance and support EBW eradication campaign through collective action. The detail of TF responsibility and accountability was set up during the partners' workshop which has been held at district level. The members of TF were also been selected from communities and partner as all participants were agreed. The TF number (23) and composition were also decided at the partners' workshop. The IDM implementation calendar was done by TF, Kebele Leaders, model farmers and Technical Team accordingly. A locally prepared, respected and approved rule (by-law) was also set up to direct and adjust if any stakeholder who violate the agreements regarding EBW disease eradication activities within the community.

**Step 5 community mobilization and implementation:** Enset EBW disease eradication campaign through collective actions requires farming community mobilization. Mass mobilization towards EBW management practices was performed after sensitizing and trainings of partners as well as farming community.

In collaboration with Technical Team from Areka Agricultural Research Centre, TF was played a leading role in mass motivation, mobilization and IDM technologies promotions.

In addition, the basic procedures that should be followed by the farming communities and stakeholders while implementing EBW control measures were demonstrated to farmers and development workers at EBW infected enset farms (Figure 1).

## RESULTS AND DISCUSSION

### Socio-demographic characteristic of the study area

The socioeconomics and disease aspects of the study area based on the information gathered from 20 sample respondents during survey were analyzed and presented in this section (Table 1). According to the descriptive analysis 5 and 95 percent of the sample respondents were female and male headed households respectively. The average age of respondents in the district is about 39.25 years. Literacy level of the sample respondents has shown that 65 percent of the sample respondents were illiterate where as 35 percent accessed to either formal and/or informal education. On average sample respondents have family size of 5.1 out of which 2.6 and 2.5 are male and female members respectively. This result also suggests that most of the farmers are middle age people who are still active to make meaningful impact in agricultural production [6].

### Gender role of enset production and marketing

Women take the lion shares in undertaking various activities in enset production and marketing (Table 2). They have more responsibility for the management and control of almost all activities. Therefore the development efforts targeted toward revitalization of enset production and productivity provides ample opportunities in maintaining gender balance.

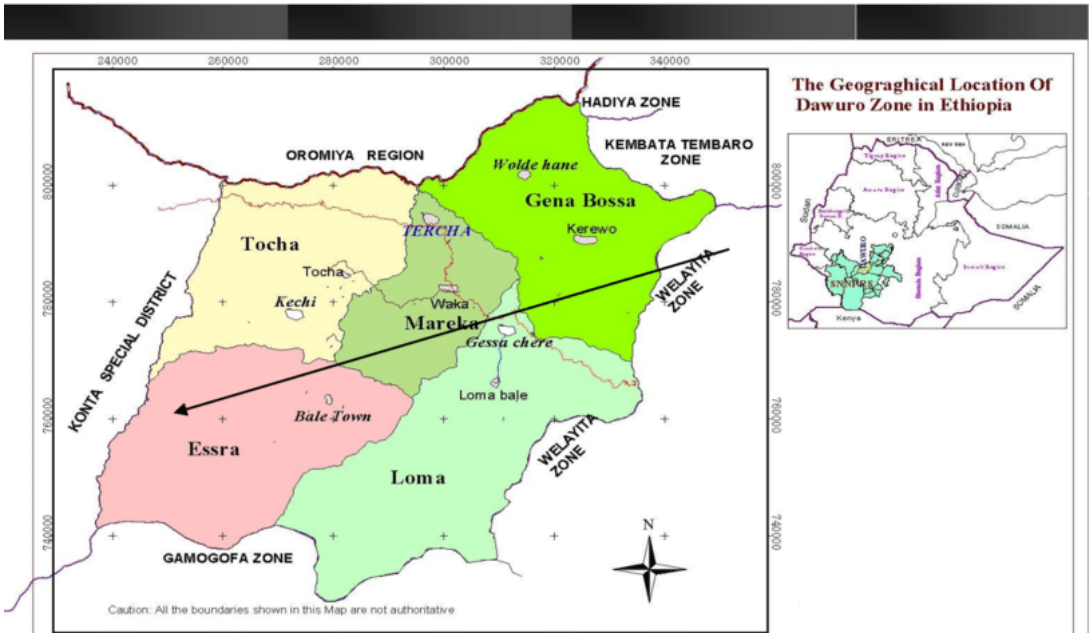


**Figure 1:** Map of the study area. Note: Regional boundary; Zonal boundary; Gravel road; Earth; Earth track; Towns. **Note:** LEGEND (---) Regional boundary; (—) Zonal boundary; (—) Gravel road; (—) Earth; (—) Earth Track; ( ) Towns.

**Table 1:** Socio-demographic characteristics of the intervention area.

| Socio-economic characteristics | Category | Name of Kebele | Total | CKD |
|---|---|---|---|---|
| | | Duzi | Gudumu | |
| Sex of the household head | Male (%) | 91.6 | 100 | 95 |
| | Female (%) | 8.3 | 0 | 5 |
| Educational (Informal) | Illiterate (%) | 50 | 87.5 | 65 |
| | Read and write | 8.33 | 12.5 | 35 |
| Age of the household head | Mean | 37.8 | 41.37 | 39.25 |
| Family live within the family (male) | Mean | 2.8 | 2,25 | 2.6 |
| Family live within the family (female) | Mean | 2.83 | 2.12 | 2.55 |
| Total family size | Mean | 3.4 | 4.37 | 5.1 |

**Note:** Source: from survey collected data.

**Table 2:** Gender balance in enset production and management in the studied area.

| Activities | Male | Female | Remark |
|---|---|---|---|
| Enset bacterial Wilt management | x | x | |
| Enset production | x | x | |
| Enset processing | | x | |
| Enset Harvesting | x | x | |
| Enset product marketing | | x | |

**Note:** Source: from survey collected data.

## Prevalence of enset bacterial wilt disease in the studied area

Farmers in the two kebeles confirmed that EBW is the most important constraint to enset production. According to the information obtained from the sample respondents about 45 percent of farmers' field in two kebeles (Duzi and Gudumu) was infected by the disease. This was the time when intervention demanded by the farmers and various partners were convinced to intervene, resource was allocated and partners shares roles and responsibilities. Researchers' team composed of different discipline had given the assignment to own and conduct in close collaboration with Bureau of Agriculture and local government authorities. End line assessment in 2013 E.C revealed that awareness creation and community mobilization play a significant role to reduce the number of infected fields to 0% (Figure 2).

## Farmers' perception and attitude on the BW disease

Over the long cultivation periods, farmers have a considerable indigenous knowledge of enset production system, clonal selection for various values. Also farmers' experience of disease prevention and control mechanism was assessed and found to be crucial and able to be well integrated in improved disease management options advocated to be implemented during the campaign. However, the initial knowledge of farmers on the bacterial wilt disease causal agent, mode of transmission and control measures has been negligible. Farmers know how about the means of EBW prevention and control and they had been utilizing them for decades to combat the horrific impact caused by the disease on enset production and productivity that they consider it as mainstay of food and livelihood bases of millions of rural poor (Table 3). However, the initial knowledge of farmers on the bacterial wilt disease causal agent, mode of transmission and control measures has been negligible. During the farmers' group discussions, it was observed that farmers have a variety of traditional believes which they think, helps to reduce the EBW disease incidence.

Some of them were dusting of ash on infected enset plants, adding of human urine at the top of infected enset, wrapping infected plant with its leaves and leaving in the field etc. Some of farmers practice smoking of bone in the fields for the EBW control. Actually these traditional approaches to treat EBW disease didn't reduce the disease pressure and at present most of the farmers doubtful on the helpfulness of practicing these traditional events in control of EBW disease.

## Awareness creation

Awareness creation training is assumed to be a vital input in an extension campaign through mass mobilization, to build up basic knowledge, strengthen the capacity of partners and build trust and confidence for changing of people's perception and attitudes. Moreover enset EBW disease control is easier when local communities aware and considers as their own task and practice recommended control measures collectively. With these regards, awareness creation trainings were given for representative stakeholders that have direct and/or indirect influence on the mass mobilization towards collective action. The trainings were designed in such a way that all stakeholders to be represented and participated and hence diffuse the enset BW management technologies information to a maximum possible range. Accordingly, subsequent trainings on improved enset production and bacterial wilt management practices have been given for a total of 56 representatives, respective and relevant trainees selected from district and kebele (Table 4).

Training materials such as manuals (10), leaflets (15) and posters (5) describing improved EBW management options and enset production technologies were prepared and distributed to stakeholders and farming communities. As a result, community views especially on the traditional EBW disease causal agent, mode of transmission and control measures have been noticeably changed and tended to apply IDM. Sensitization, inspiration and mass mobilization trainings were found very useful approach for the collective action based EBW wilt disease management. Similarly, a recent study reported by Zerihun specifies the importance of community mobilization and awareness creation for the management of enset BW disease.

## Enset bacterial wilt eradication campaign

According to the initial discussions, the reasons are expectation and demand for chemical control measure and assuming that IDM without chemicals is labor consuming and tedious. Regarding the use of chemicals, for the control of enset BW, it is not yet investigated well, because of chemical control method is likely infeasible for EBW control in enset. Obviously, chemicals especially bactericides are dangerous and complex to handle and not simple to use at small scale enset farmers, leave poisonous residues to affect human health and environment. After subsequent sensitizations, awareness creation trainings including demonstration of EBW control measures, farming community understood the scientific approach and farmers develop trust and knowledge on the effectiveness IDM and later on started to practice through collective action (Table 5).

The reasons for the importance of collective action is that uprooting and disposing of infected enset plants from enset fields into pits demand more labors and times that it is very difficult/heavy task for some households having small size of family. So there were numerous governmental and cultural organizations include Farmers Development Group, One to Five Unit, etc. identified as an effective form of collective in the community that have been actively involved in an eradication campaign against EBW.

Implementing of sanitary control measures such as uprooting and burying in dug pits outside the enset fields and/or burning with fire (Figure 3); disinfecting farming tools with fire flame, used during collective action of EBW eradication; along with replanting of disease free and EBW resistance/tolerant enset clones in place of removed infected plants were among the major activities practiced. Because of the perennial nature of enset plantation, it is difficult to apply crop rotation on the whole enset field. In highly infected (at hotspot) fields partial crop a rotation at least for one year was also applied.

## Evaluation of collective action

At the end of the study, post intervention assessments were carried out from 20 randomly selected farmers' enset fields using checklists, to ascertain farmers' attitude change and the effectiveness of community based integrated management of EBW through collective action at the respective locality. Participatory monitoring and evaluation was executed with technical committee (enset research project team), development agents, extension experts and model farmers (men and women).

Being compared of pre and post IDM intervention through mass mobilization and collective actions, the survey and surveillance results were summarized and presented in Table 5. There were considerable changes of a farming community perception and

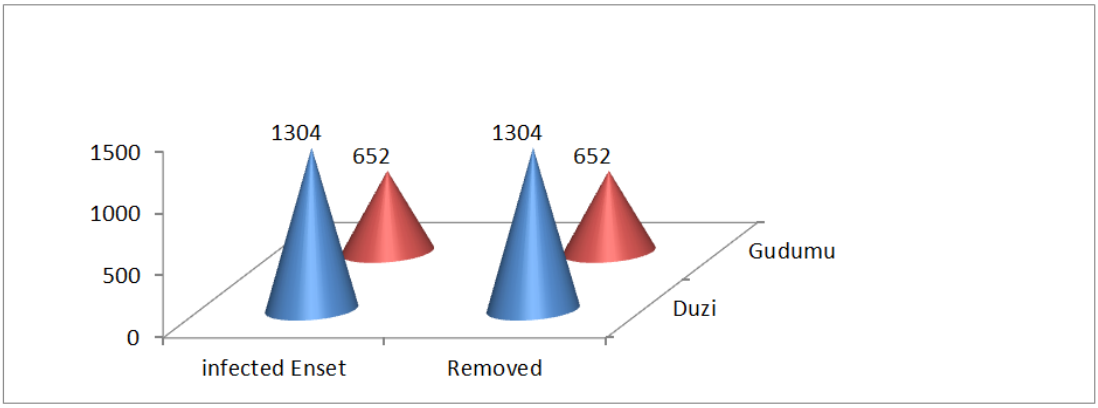


**Figure 2:** Number of infected and removed Enset. **Note:** Blue=Duzi; Red=Gudumu. **Note:** (■) Duzi; (■) Gudumu.

**Table 3:** Farmers' perceptions on symptoms, causal agents and control measures of EBW.

| Description | % of farmer practices | |
|---|---|---|
| I. Symptom | Duzi | Gudumu |
| • Yellowing of leaf | 16,66 | 25 |
| • Central leaf become yellow and wilted | 41.66 | 25 |
| • Yellowing and burning/drying of leaf | 25 | 25 |
| II. Causal agent | | |
| • Air | 8.33 | 12.5 |
| • Contaminated materials | 8.33 | 12.5 |
| • Bacteria | 8.33 | 12.5 |
| • I don't know | 33.33 | 37.5 |
| • Wind | 8.33 | 0 |
| • Cow dung | 25 | 25 |
| • Climate change | 83.33 | 87.5 |
| III. Control measures | | |
| • Collective action (EBW control measures) | 83.33 | 87.5 |
| • Process for food as the symptom is observed | 75 | 62.5 |
| • Use disease free planting material | 100 | 100 |
| • Smocking of bones | 25 | 37.5 |
| • Dust application | 16.66 | 25 |
| • Human urine application | 8.33 | 12.5 |
| • Rouging | 91.66 | 87.5 |

**Note:** Source: Survey data.

**Table 4:** Number and category of participants during the training.

| Type of training | Training place | Participant category | Male | Female | Total |
|---|---|---|---|---|---|
| Theoretical and practical | at district level | Farmers | 7 | 10 | 17 |
| | | Farmers having infected farm | 5 | 5 | 10 |
| | | Model farmers | 5 | 5 | 10 |
| | | KA and School leaders | 2 | 4 | 6 |
| | | Local Institution | 0 | 0 | 0 |
| | | Development Agents | 2 | 2 | 4 |
| | | District Agri. Experts and district admin. | 3 | 6 | 9 |
| | | Total | 24 | 32 | 56 |

**Note:** Source: training data.

**Table 5:** Comparative results of farmers' knowledge and perception on the EBW disease.

| Description | Pre-intervention (%) | Post-intervention (%) |
|---|---|---|
| Framers' knowledge and perception on the EBW disease | 24 | 24 |
| • Causal agent | 10 | 80 |
| • Mode of transmission | 55 | 90 |
| • Symptoms identification | 50 | 95 |
| Use of EBW disease management methods | | |
| • Cultural practices | 75 | 90 |
| • Disease free and resistant/ tolerant clones | 75 | 100 |
| • Sanitary control measures | 10 | 70 |
| • IDM | 5 | 80 |
| EBW management through collective action | 5 | 90 |
| EBW incidence | 45 | 15 |
| Farmers adapting IDM | 5 | 85 |

**Note:** Source: Survey data.

**Figure 3:** Awareness creation through theoretical and practical training.

attitudes after subsequent sensitization, mass mobilization, awareness creation trainings and demonstration of integrated control measures.

Farmers and relevant experts build up a basic knowledge and trust on the bacterial disease management practices collectively, strengthen the competence of local partners on the integration of the best control components application. Majority of the farmers aware about EBW disease behavior and adopt effectiveness of IDM in checking EBW disease. As a result the infectivity of EBW disease was diminished at study area.

Pre-intervention of IDM, the disease incidence was high and it was minimized to after implementation of IDM through collective action [7,8].

## CONCLUSION AND RECOMMENDATION

This simple intervention demonstrated that the disease impact can be minimized at least in the short term to a significant level. Community mobilization and awareness creation were the most effective in imparting knowledge about EBW control to farmers and mobilizing farmers to use the practices for EBW control. This may be attributed to the higher level of interaction between research, extension agents and farmers.

Implementing of IDM under real enset farming community conditions in collaborations with responsible partners and assistance of local administrative is the most advisable approach at hand, believed enable to attain successful and sustainable results. In addition it was recommended that all farmers in the area should maintain strict and procedural application of IDM on regular basis to reduce EBW infection under low level; subsequent awareness creation trainings of farmers on the exact and practical use of IDM is also very vital approach.

## ACKNOWLEDGEMENT

The study was financed by the McKnight foundation and Agricultural Growth Program II (AGPII). We thank Areka, Agricultural Research Centers and Southern Agricultural Research Institute for hosting and provision of necessary services and facilities during field demonstration and training. We thank enset producing farmers in the district for their participation and sharing of ideas and knowledge on the different aspects of enset.

We are also grateful for the development agents that assisted in the interviews and intervention with farmers.

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