Tanzania Coffee Research Institute

Lyamungu Moshi Tanzania

COFFEE WILT DISEASE (TRACHEOMYCOSIS) IN TANZANIA (*Fusarium xylarioides*)

A COUNTRY REPORT

COFFEE WILT DISEASE (TRACHEOMYCOSIS) IN TANZANIA
(Fusarium xylarioides)

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By:

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1.0 Summary

Current situation of Coffee Wilt Disease (CWD) affecting Robusta coffee in Tanzania is presented in this report. Also results of on-farm trials involving 2 agronomic practices and 3 control methods, and their performances are highlighted. Training of extensionist and farmers and ways to disseminate information on CWD management are also reported. Farmer Field School (FFS) curriculum development as a way to empower coffee farmers using participatory approaches to raise awareness of CWD and manage its development is also reported. Apart from programmes organized by Regional coffee wilt Project, internal efforts to ensure sustainability of coffee production in Tanzania are highlighted. Progress geared towards the variability studies of the pathogen Fusarium xylarioides is touched.

2.0 Introduction

Since its outbreak in 1997, CWD is only reported to affect Robusta coffee in the three districts of Kagera; Bukoba, Muleba and Karagwe. The disease has been seriously affecting the livelihood of about 70,000 families who depends on Robusta coffee. Hence precautionary measures to eradicate or prevent it from wider distribution within the country particularly Kagera region are necessary. Tanzania through Coffee Research Institute is working with CABI and other countries in East and Central Africa to implement short term as well as long term programmes to limit its spread and formulate effective control measures.

Progress of different efforts made in Tanzania to prevent further spread of CWD and other management strategies accomplished in 2004 are highlighted in this report.

3.0 Current situation

The disease continues to threaten coffee production in Kagera in varying intensities. Division of Bugabo (Bukoba District), Muleba (Muleba District) and Kaisho-Murongo (Karagwe District) where CWD out break was earlier reported to be at higher incidences (Fig. 2), continue to affect Robusta coffee production. .

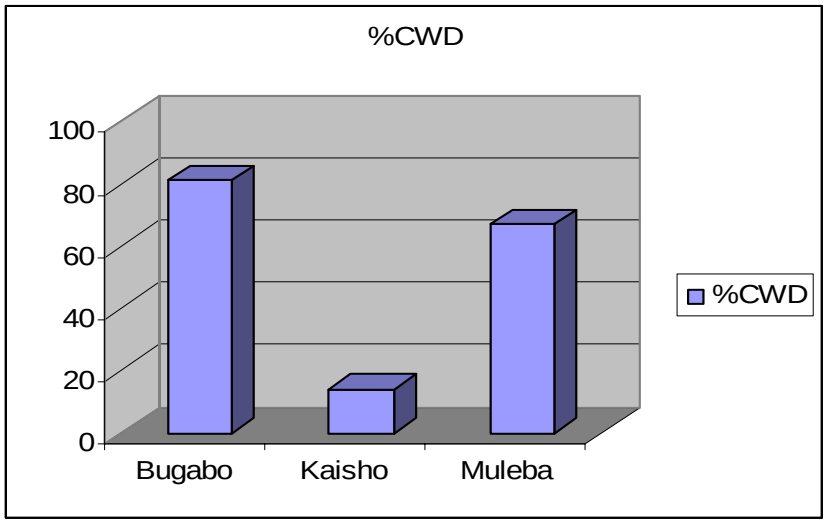

Fig 1: CWD incidences in the three divisions of Kagera region.

In these areas CWD has not infected the adjacent Arabica growing trees. This observation suggest the possible physiological specialization of *Fusarium xylarioides* and in Kagera , its adaptation to Robusta host plant in Kagera. In northern part of Kagera, groups of infected farms are detected while in the southern part, only isolated farms are observed. This suggests that the disease could spread over long distance, initiate infection and progress according to a focus pattern.

4.0 Field trials to assess the effect of agronomic and control practices on CWD

Monitoring to quantify the effect of different agronomic practices on the incidence of the disease, and evaluate the efficacy of different control methods in managing the disease, by involving farmers, extension workers and researchers continued through out the season; up to October 2004. The agronomic practices and control methods remained the same as in 2003:

Agronomic practices

- Use of herbicides (Round-up) at a rate of 150 ml in 15 litres of water.
- Use of mulch (leave 15 cm diameter around the base of the stem)

Control methods

- Stem paint using copper oxychloride from the soil level to 50 cm at a rate of 300gms in a litre of water, once in 4 months.
- Spray of copper oxychloride at a rate of 40 gms per 7.5 litres of water once per month during rainy season and every 3 months during dry season.

Farmers' experience

Use of ash around collar position of the coffee stems 30 cm diameter and 50 cm thick. One litre container full of ash once per season is applied.

Design

Each trial site comprises of 6 blocks each with 15 Robusta trees. Each farm of 12 on-farm trial is a replicate. Combination of practices/treatments varies from farm to farm to allow randomization.

Data collected

General

Trials have been superimposed in Robusta plants of around 50 years old. The type of Robusta coffee dominating is semi-erect, 80% intercropped with bananas. Almost in all sites there are shade trees within or around the fields.

Kagera receives bi-modal rainfall, and temperatures are usually moderate to hot (average 26^0C). As rainfall is reported to be a key factor to the outbreak and intensity of CWD, representative rainfall data is presented in figures 2 & 3.

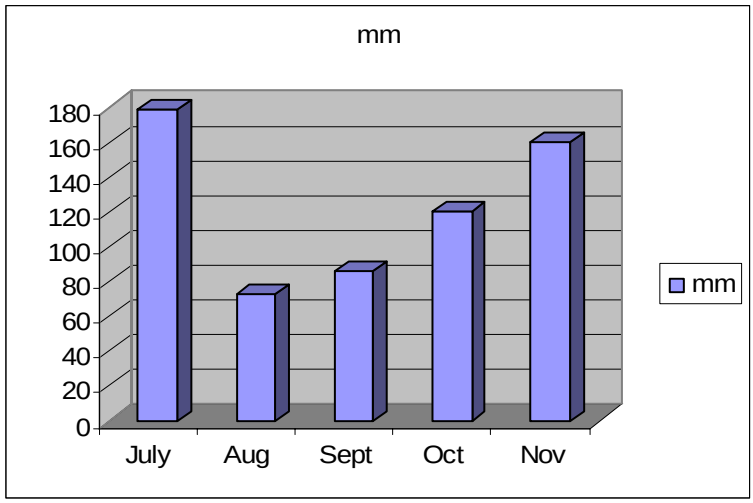

Fig. 2: Rainfall distribution & intensity Bukoba (2003).

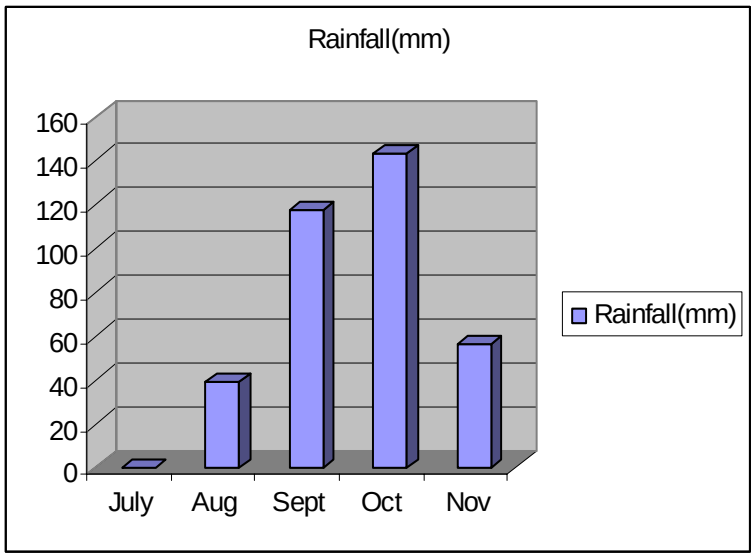

Fig. 3: Rainfall distribution & intensity Karagwe (2003).

Results & discussion:

Progress of treatments performance

Result on treatment performance for Karagwe and Bukoba are presented in table 3 and 4 respectively. Data on treatment performance; number of affected Robusta coffee trees per plot were recorded on monthly bases. The level of CWD around the trial sites and in control plots is higher this season than in 2003. This season; 2004 in Karagwe plots reated with ash, stem paint and mulch had low score of CWD incidences (Table 3) and for the on-farm trials of Bukoba; stem paint, use of herbicides and application of ash had minimal CWD scores. Last season in Karagwe plots treated with stem paint and use of ash had low CWD scores and in Bukoba plots treated with mulch, ash and use of herbicides. Final conclusion on treatments performance will be made by the end of 2005.

Incidences of CWD in relation to rainfall

Although there are no whether station in most of the on-farm trials but incidences of CWD have been observed to be increased between July to November both in 2003 and 2004. Progress of treatments performance and rainfall for Bukoba and Karagwe supports (Append: 1, fig. 2 & 3).

Table 3: Mean percent CWD Incidence of treatments in on-farm trial sites Karagwe December 2003 to October, 2004.

Treat	**Rukuraijo Alt. 1311 m a.s.l % CWD Incidence**		**Yield in kg /ha.**	**Omka'ndu Alt. 1354 m a.s.l %CWD Incidence**			**Omka'ndu Alt. 1345 m a.s.l % CWD ncidence**			**Nyakatuntu Alt. 1425 m a.s.l %CWD Incidence**		**Yield in kg /ha.**	**Nyakatuntu Alt. 1422 m a.s.l %CWD Incidence**		**Yield in kg / ha.**	**Nyabishenge Alt. 1370 m a.s.l % WD Incidence**		**Yield in kg /ha.**
	'03	**'04**		**'03**	**'04**		**'03**	**'04**		**'03**	**'04**		**'03**	**'04**		**'03**	**'04**	
Stem paint	0.0	0.0	505	0.0	0.0		0.0	0.0		0.0	6.7	861	0.0	6.7	929	0.0	0.0	111
Spraying	0.0	0.0	303	0.0	0.0		6.7	6.7		13.3	13.3	1547	6.7	13.3	184	0.0	0.0	109
Use of ash	0.0	0.0	303	0.0	0.0		0.0	0.0		0.0	0.0	1213	0.0	0.0	386	0.0	0.0	293
Use of herb	0.0	0.0	303	6.7	13.3		0.0	13.3		0.0	0.0	1913	0.0	0.0	708	0.0	0.0	142
Use of mul	0.0	0.0	404	0.0	0.0		6.7	13.3		0.0	6.7	1452	0.0	0.0	342	0.0	0.0	130
Control	0.0	0.0	533	0.0	0.0		13.3	13.3		0.0	0.0	1348	0.0	0.0	483	0.0	0.0	128
Est.% CWD	20	20		10	20		10	20		20	20		20	20		60.0	60	

Table 4: Mean percent CWD Incidence in treatments across on-farm trial sites Bukoba July to November, 2003.

Treatments	**Ibosa Alt. 1274 m a.s.l % CWD Incidence**		**Yield in kg/ ha**	**Ibosa Alt. 1262 m a.s.l %CWD Incidence**		**Yield in kg/ ha**	**Kiilima Alt. 1237 m a.s.l % CWD Incidence**		**Yield in kg/ ha**	**Bushasha Alt. 1192 m a.s.l %CWD Incidence**		**Yield in kg/ Ha**	**Kikukwe Alt. 1187 m a.s.l %CWD Incidence**		**Yield in kg/ ha**	**Kigazi Alt. 1215 m a.s.l % CWD Incidence**		**Yield in kg/ ha**
	'03	**'04**		**'03**	**'04**		**'03**	**'04**		**'03**	**'04**		**'03**	**'04**		**'03**	**'04**	
Stem paint	0.0	0.0		0.0	0.0		0.0	0.0		23.3	60.0		0.0			6.7	6.7	
Spraying	6.7	26.7		0.0	20.0		0.0	26.7		21.7	53.3		0.0			0.0	13.3	
Use of ash	0.0	6.7		0.0	6.7		0.0	6.7		11.1	26.7		0.0			6.7	26.7	
Use of herbicide	0.0	0.0		0.0	0.0		0.0	0.0		11.1	20.0		0.0			6.7	20.0	
Use of mulch	0.0	15.4		0.0	0.0		0.0	13.3		6.7	40.0		0.0			0.0	26.7	
Control	0.0	20.0		0.0	33.3		0.0	13.3		0.0	26.7		0.0			0.0	0.0	
Est.% CWD	40	40		30	30		25	25		70	90		5			10	20	

5.0 Increase farmer's awareness

Information dissemination and conducting training to farmers is the thrust of this component. During 2004 this has been achieved by availing leaflets, brochures and on spot advices. Also various forums organized by Districts or Regional authorities eg. Regional Central Committee. Trainings of extensionists, farmers and dealers in NGOs assisted to increase public awareness of CWD problem.

5.1 Information dissemination

5.1.1 Training of farmers

From the start of the project up to 2003, a total of 1382 farmers were trained in aspects of identification and management of CWD.

This season the distribution of farmers trained in Bukoba , Karagwe and Muleba is as follows:-

District	Number of farmers trained	Target
Bukoba	63	46
Muleba	56	41
Karagwe	48	35

Most of the farmers in Kagera about 60% are aware of the problem of CWD and ways to minimize its damage.

5.1.2 Use of policy maker's forums to disseminate information on CWD

During the open day organized by TaCRI on 17th September, 2004; a total of 49 policy markers including the Regional Commissioner, 5 District Commissioners & 5 District Executive Directors of Kagera region and the guest of honor the Principal Secretary in the Ministry of Agriculture and Food Security attended the event. This provided an opportunity to explain progress of CWD in Kagera and intervention of policy markers in the management of the Disease. The feed back was very positive. In addition to policy markers, 10 coffee buyers and 300 farmers from all districts affected by CWD attended the open day. This gave the opportunity to create awareness, impart more knowledge on CWD and attention of research and other partners to address the problem.

From May 21, 2003 whereby policy markers were high lightened on the danger of CWD to the livelihood of coffee farmers in Kagera, progress of activities on the management of the disease is reported in every meeting from ward, divisional, district to regional level.

5.1.3 Training of Extensionist

Up to the end of 2003 at least 98 extensionists were able to train farmers at various aspects of CWD, and 42 used to create awareness in none Fusarium wilt areas. This season a total of 21 extension staff were trained/some re-trained in CWD problem areas in the three districts of Bukoba, Muleba and Karagwe. This assisted to disseminate more knowledge in the management of CWD.

It is encouraging to note that most of extension workers trained incorporate training aspects on CWD to farmers on their monthly coffee husbandry training programme. They also report efforts to minimize the level of the disease (eradicated trees) new Robusta farms with fusarium wilt attack and restrictions on movements of seedlings of infected areas to non-infected.

5.2 Dissemination materials – Distribution of extension materials

Leaflets and posters prepared by TaCRI and CABI were distributed to coffee stakeholders; extension workers, farmers, coffee buyers, cooperative unions and members of parliament as follow:-

Stakeholders	Number of leaflets	Number of posters
DALDO Karagwe	120	50
DALDO Bukoba	130	60
DALDO Muleba	100	40
Regional office Kagera	10	10
Kagera Cooperative Union	6	6
Members of Parliament Bukoba	20	
Kigoma region-non CWD affected areas	150	120
Nanenane Agricultural show Bukoba	300	500
Total	836	786

The leaflet and posters assisted to create more awareness and also as training materials.

5.3 Farmers and Extension Workers coping with practices in on-farm trials:

Farmers near on-farm trial sites are coping with practices applied in on-farm trials. For example some farmers are practicing ash application at the base of coffee trees, because they have seen Robusta plants in on-farm trials with ash application showing vigour. Extension workers are using the trials to conduct trainings on CWD management. This is in addition to assessment of the practice

5.4 Farmer groups formulation

A total of seven farmer groups are in place in most of CWD affected areas in Kagera.

Each group is having a total of 12 farmers. The roles of farmer groups are:

- To impart knowledge and sharing of experience with fellow coffee farmers with respect to management of fusarium wilt.
- Collect effort in eradication of fusarium wilt affected trees in their areas.
- Assist in locating and reporting new cases of fusarium wilt.

Farmer groups have proved to be very effective in minimizing the problem of CWD. They meet once per month to discuss the progress of CWD management.

5.5 Develop curricular for farmer participatory field school activities:

5.5.1 Curriculum for training is intended to empower coffee farmers using participatory approaches to raise awareness of CWD and manage its development.

5.5.2 Workshop for FFS curriculum development was conducted in Kagera from 27th – 28th May

2004. Eighteen participants attended the workshop, the breakdown is as follows:-

- Extension workers 10

- Farmers 2
- Researchers 5
- CABI 1

5.5.3 Highlights of the workshop:

5.5.3.1 Participants evaluated the activities of CWD project and feedback was as follows:

Achievements:

- Majority of the farmers in Kagera are able to identify symptoms of CWD and can differentiate it from other disorders
- Trainings on the danger on CWD, convinced majority of the farmers to uproot and burn CWD affected plants, slowly minimizing its effect
- Farmers, Extension workers and Researchers are working together as a team
- Extension workers are equipped with the knowledge of fusarium wilt and ways to manage

Limitations:

Participants reported:

- Lack of CWD resistant Robusta plants
- Low coffee prices
- Older farmers being involved in coffee farming as limitations to make full advantage of the project

Suggestions:

- Improvement of coffee prices; consider price differentials
- Research to get CWD resistant varieties
- Organize more training to extension workers and farmers

5.5.3.2 Agree on the composition and organization of the FFS as follows:

- FFS group of farmers; 15 – 30 farmers
- FFS field: ½ acre in Bukoba & Muleba, 1 acre in Karagwe
- FFS facilitators for each group to involve two extension workers
- Frequency of FFS sessions; once per month

5.5.3.3 FFS study plots: Comprises of a farmer and improved practices.

5.5.3.4 Progress of FFS group formulation:

Manage to establish FFS group for Bukoba based at Kiilima.

Seasonal calendar was developed, site earmarked and 32 participants have been registered under temporary leadership.

5.5.3.5 Way forward: Formulate FFS gp for Muleba and Karagwe, and strengthen already formed group in Bukoba.

5.6 Visit and pass on information to farmers

Regular visits have been made by extensionists & researchers to farmers and pass on information on:

- How to identify CWD affected tree
- Handling of CWD affected tree
- Destroying of CWD affected tree

Leaf lets have been used extensively as training materials on the identification, handling of Robusta diseased plant and management of CWD.

On spot advices were given to minimize the spread of Fusarium wilt.

More than 3000 farmers have been visited and given on-spot advices.

6.0 Eradication programme

Coffee stakeholders workshop organized by TaCRI and the Ministry of Agriculture and Food Security in May 22, 2003 made important decisions to curb the spread of CWD. Stakeholders decided to eradicate trees affected by Fusarium wilt without compensation. The exercise is supported by District Councils, the Ministry of Agriculture and Food security, coordinated by TaCRI.

Eradication started end of June 2003 in Muleba proceed in parts of Bukoba and Karagwe. 20% of CWD affected trees were uprooted and the progress is satisfactory.

7.0 Epidemiology and the variability studies of the coffee wilt pathogen *Fusarium xylarioides* (under the support of DFID):

Progress:

Wood samples affected by fusarium wilt were collected in 15 locations in the three districts of Bukoba, Muleba and Karagwe. The samples were collected between 1189 to 1659 m.a.s.l, and coordinates between East 030^0 39.855" to 031^0 50.682 and South 01^0 00.044" to 01^0 49.702". Replica of the samples was sent to CABI UK and another replica remained at TaCRI Lyamungu for isolation and pathogenicity studies.

It is expected that by the end of this year the studies on the level of pathogenicity will be completed.

8.0 Screening resistance of Robusta lines in CWD garden:

Since the appearance of coffee wilt disease (CWD) in Tanzania in 1997, reports of the disease on most of the commercial Robusta varieties (clonal/seed) continue to be receiving. It is therefore necessary to confirm and establish the reaction of Robusta varieties under disease garden.

Materials and Methods

A total of 216 clonal seedlings were raised from different Robusta lines. The plants at the age of 3 months were inoculated to the disease under screen house. Inoculum was prepared from fresh samples of CWD infected woods, standard spore suspension of 1.3×10^6 spore/ml. Inoculation was done on 1st May 2004 by making in scion at a middle of a seedling stem, then 1 ml drop of *Fusarium xylarioides* suspension injected. Assessment was done at 30, 60, 90 and then continue to 120, 150, 180, 210, 240 and 270 days after inoculation.

Progress:

Reaction of the seedlings after 120 days of inoculation date shows infection level of 0% to 100%. The promising seedlings will be correlated to data on yield and tolerance / resistance to leaf rust before conducting on-farm trials.

Appendix1. Details on the progress of CWD in on-farm trials indicating number of trees affected per 15 trees in a plot.

Omkagando (Christian Songambele)

Treatments	Febr.	March	April	May	June	July	Aug.	Sept.	Oct.
Mulching			0	0	0	0	2	2	2
Spraying			0	0	0	0	1	1	1
Control			2	2	2	2	2	2	2
Herbicide			1	1	1	1	2	2	2
Ash			0	0	0	0	0	0	0
Stem paint			0	0	0	0	0	0	0

Nyakatuntu (Murshid Yusuf.)

Treatments	Febr.	March	April	May	June	July	Aug.	Sept.	Oct.
Mulching			0	0	2	2	2	2	2
Spraying			2	2	3	4	4	4	4
Control			0	0	2	2	3	3	3
Herbicide			0	0	0	0	0	0	0
Ash			0	0	0	1	1	1	1
Stem paint			0	0	0	0	0	0	0

Ibosa (Alexander Kempanju)

Treatments	Febr.	March	April	May	June	July	Aug.	Sept.	Oct.
Mulching		0	0	0	0	0	0	0	0
Spraying		2	3	3	3	3	3	3	3
Control		4	4	4	4	5	5	5	5
Herbicide		0	0	0	0	0	0	0	0
Ash		0	0	0	0	1	1	1	1
Stem paint		0	0	0	0	0	0	0	0

Minziro (Saidi Zuberi)

Treatments	Febr.	March	April	May	June	July	Aug.	Sept.	Oct.
Mulching		3	3	3	4	4	4	4	4
Spraying		2	2	2	2	2	2	2	2
Control		0	0	0	0	0	0	0	0
Herbicide		0	3	3	3	3	3	3	3
Ash		2	2	2	4	4	4	4	4
Stem paint		0	0	0	0	0	0	0	0

Ibosa (Ponsian Tibesigwa)

Treatments	Febr.	March	April	May	June	July	Aug.	Sept.	Oct.
Mulching		2	2	2	2	2	2	2	2
Spraying		2	3	3	3	4	4	4	4
Control		2	2	2	2	2	3	3	3
Herbicide		0	0	0	0	0	0	0	0
Ash		0	0	0	1	1	1	1	1
Stem paint		0	0	0	0	0	0	0	0

9.0 Acknowledgement

Greatly appreciate CFC and EU through CORNET for supporting CWD programmes in Tanzania. Also acknowledge the role of CABI as PEA in facilitating CWD activities in Tanzania.