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Evaluation of Tomato Varieties for their Adaptability to Rainy Season Production in Centre-North and Eastern Regions of Burkina Faso

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FEED THE FUTURE INNOVATION LAB FOR HORTICULTURE

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COVER PHOTO: Farmer participant in seed trial. Photo by Dr. SOME Koussao

Horticulture Innovation Lab

The Feed the Future Innovation Lab for Horticulture is a global research network that advances fruit and vegetable innovations, empowering smallholder farmers to earn more income while better nourishing their communities. The program's research portfolio spans the value chain of fruit and vegetable production, from seed systems to postharvest processing, in Africa, Asia, and Central America. The Horticulture Innovation Lab is funded by the U.S. Agency for International Development and led by a team at the University of California, Davis, as part of the U.S. government's Feed the Future initiative.

Agribusiness Associates

Started by Mr. Gurbinder Singh Gill, Agribusiness Associates is an international development consulting firm focusing on overcoming the biggest challenges in the agricultural sector. The firm has special expertise in offering comprehensive solutions to the agribusiness sector for enterprise development. ABA has worked in public-private partnerships, seed industry, technology adoption, capacity building and providing strategic advisory services.

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Any remaining errors and omissions are the responsibility of the contributors to the report.

CONTENTS

List of Figures

1. BACKGROUND

In Burkina Faso, annual tomato production is increasing steadily and is consistent with the market growth and increased demand. Among vegetables, for the past five years, tomatoes are ranked second after onions. The tomato production in Burkina Faso is facing several constraints, including increasing pest pressure from *Bemisia tabaci*, *Helicoverpa armigera*, and *Tuta absoluta*. This increased pest pressure has forced producers to intensify chemical treatments beyond suggested recommendations, therefore, increasing the risk to human health. Another significant constraint the tomatoes are facing is the postharvest losses that are a combination of many factors and have become a crucial issue in Burkina Faso. Depending on the season and the location, tomato losses in Burkina Faso can range from 20% to 60%. Around 80% of tomato is produced during dry season resulting in a glut of tomatoes in the market. In contrast, during the rainy season, tomatoes become scarce in the market which results in increased cost and reduced accessibility to the consumers. The major reasons for reduced yield during the rainy season are - lack of varieties adapted to the rainy season, the increased prevalence of diseases, and the poor agronomic practices.

To address the above-mentioned challenges, this study was conducted with the following objectives:

- Identify suitable tomato varieties for rainy season production
- Improve rainy season production practices including disease and pest control as well as agronomic practices

2. METHODOLOGY

2.1 Tomato Varieties

A total of four tomato varieties known for their adaptation to rainy season production were used - FBT3 from INERA, AVTO-1122 from World Vegetable Center (the most successful after year 1 trial), MONGAL and COBRA from Technisem. It is important to note that

these varieties were used during the first year of evaluation and had produced good results at farmers field trials. The second-year trials were conducted to confirm field performance and farmer acceptability of these varieties.

2.2 Selection of Tomato Producers

On behalf of seven communities, CRS/Burkina Faso (Programme FASO) had identified 17 tomato producers (Table 1) to conduct the trials. In addition, all the tomato farmers from these communities were invited during field demonstration days. Depending on their capacity to allocate farm for the trial, each farmer decided on the size of the farm and the varieties to use.

Table 1. Group of tomato producers selected by CRS/BF to conduct the trial

Regions	Provinces	Communes	Villages	Name of farmers	Trial Area (Ha)
Central-North	Namentenga	Yalgo	Kario	DABILGOU Foubla	0.5
Central-North	Namentenga	Yalgo	Kario	SIOGO Moussa	0.5
Central-North	Namentenga	Yalgo	Kario	YAMEOGO Moryamba	0.5
Central-North	Namentenga	Yalgo	Kario	BAGUIAN Oumarou	0.5
Central-North	Namentenga	Yalgo	Kario	SIOGO Hamado	0.5
East	Gnagna	Manni	Dakiri	YARGA Assouna	0.0625
East	Gnagna	Manni	Dakiri	YARGA Roger	0.0625
East	Gnagna	Manni	Dakiri	YARGA Djéni	0.15
East	Gnagna	Manni	Dakiri	YARGA Jérôme	0.0625
East	Gnagna	Manni	Dakiri	BOURGOU Christophe	0.0625
East	Gnagna	Manni	Dakiri	KOURA Djaoudoa	0.0625
East	Gnagna	Manni	Pougdiari	GUITANGA Yéhangla	0.25
East	Gnagna	Manni	Pougdiari	TINDANO Libribouga	0.05
East	Gnagna	Manni	Pougdiari	BOURGOU Possi	0.25
East	Gnagna	Manni	Nagbingou	TINDANO Bantia	0.1
East	Gnagna	Manni	Boungou Folgou	BANGA Larba	0.5
East	Gnagna	Manni	Margou	TINDANO Talata	0.25

2.3 Establishing Tomato Nurseries

For the nursery production, tomato seedbeds were prepared and for each of the seven communities, organic manure was incorporated in the seedbeds. Due to recurrent fungal

diseases during the rainy season, the seeds of each variety were treated with fungicide, *Caïman*, before sowing. The insecticides *Lamda super* and *Protect 1.9 EC* were provided to each group for the early protection of the young tomato plants that are more susceptible to diseases or pests in the absence of protection.

In addition, one 50 kg bag each of NPK fertilizer and Urea were also given to each group to be used during the nursery production and transplantation in the field. The nursery beds were prepared as a mounds type compared to the dry season nursery to avoid waterlogging that could lead to plantlets death. The nurseries were established between July 16th 2017 and July 19th 2017 in all the seven communities.

Figure 1. Nursery establishment with tomato producers

2.4 Field evaluation

About 28 days after nursery production, the tomato plantlets were transplanted into the fields by all the 17 selected farmers. The transplantation in each site was done with the assistance of the field technicians of CRS/BF who were fully involved in the entire process.

NPK was applied 15 days after planting at a rate of 300 kg/ha. Fifteen days later the Urea was applied at a dose of 150 kg/ha.

2.5 Field visits

Two field visits, one at the full vegetation stage and the second at harvest, were organized in a participatory manner and included farmers, CRS/BF staff, and INERA staff.

3. MAIN FINDINGS

The results from 2018 trials were affected by the seasonal rainfall that resulted in flooding, especially in the low land area.

3.1 At the nursery stage

From the past experience of 2017 trials, the mode of nursery preparation was closely monitored to ensure that the nurseries were prepared in the form of the mattress instead of hollow nurseries.

At Dakiri, most of the seed beds were established in lowlands, therefore, the majority of the young plantlets were lost due to heavy rains and water flooding.

Figure 2. Nursery of 20 cm height

The survival rate of plants varied among different locations and varieties tested. Almost all the nurseries were destroyed by the rains at Kario and Yalgo locations and 30% were destroyed at Dakiri. At Pougdiari and Margou locations, the nurseries were well maintained during the rainy season. Among the 4 tomato varieties tested, FBT3 and AVTO1122 were most affected at the nursery stage during the rainy season while Mongal and Cobra varieties were least affected, with only 10% plant death reported.

3.2 Field days

Field days were organized at the two important stages of tomato development, first at full vegetation and then at harvest-ready stage. The initial field day was intended to assess the varietal growth habits and their resistance to diseases and pests. Varietal tolerance

against abiotic stress such as flooding was also assessed.

The pest attacks observed during field days varied among locations. In Dakiri, the red mite was the major insect pest that was destroying almost all the young tomato fruits, while at Kario and Yalgo FBT3 was negatively affected by water excess. However, at all the locations, the best performing variety was Mongal, it has better tolerance to diseases, pests, and waterlogging. The other varieties showed intermediate behaviour. Among other major insect pests, *Helicoverpa armigera* caterpillars inflicted severe damage on plant leaves and fruits.

Figure 3. TINDANO Talata field at Margou in Manni district

Figure 4. YAMEOGO Moreyamba's field with stakes at Site Yalgo

Figure 5. Yalgo SIOGO Hamado used stakes to help the tomato plants stand avoid rotting and diseases.

During the harvest field day, farmers' evaluation of each variety was based on its yield performance and the quality of fruits harvested. Table 2 below highlights the evaluation.

Table 2. Overall variety assessment by location

Site	Producer	Variety grown	Ranking according to performance and fruit quality	
			Fruit quality	Performance
Margou	TINDANO Talata	Mongal, FBT3, Cobra et AVETO 1122	FBT3 =1st Mongal=2nd	FBT3 = 1st Mongal=2nd
Poudgari	TINDANO Librigouba	Mongal, FBT3, Cobra et AVETO 1122	FBT3 =1st Mongal=2nd	FBT3 = 1st Mongal=2nd
Dakiri	DJIBOUGOU Djeni	Mongal, FBT3, Cobra et AVETO 1122	Cobra =1st	
Kario	SIOGO Hamado	Mongal, FBT3	FBT3 =1st Mongal=2nd	Mongal=1st FBT3=2nd
Kario	YAMEOGO Moreyamba	Mongal, FBT3	Mongal=1st	Mongal=1s

After the field evaluation, Mongal and FBT3 were the best varieties among the four tested. The average yield of these two varieties was estimated at ≥ 15 T/ha by INERA team. The variety AVTO 1122 had less yield, small fruit size, and susceptibility to fruit necrosis while COBRA variety could not survive against insect pests attack that affected its fruit quality too. The overall results were affected by unexpectedly heavy rainfall.

During 2017 trials, farmers identified AVTO 1122 and Mongal as varieties with a good growth ability and production. The INERA variety FBT3 was very healthy at nursery and in the field but had poor branching. However, the production was appreciated by farmers. Due to fungi, tomato losses during the nursery stage were high for varieties ICRISINA, Petomech, and COBRA. These losses were further amplified by aggressive rainfall. These varieties had serious health issue from nursery to the field as they were susceptible to fungal, bacterial, viral diseases and insect damage.

4. CONCLUSION

Successful tomato production in the rainy season is a combination of good agronomic practices as well as pest and disease control. However, the availability of suitable varieties remains the critical factor for successful tomato production during the rainy season. Based on data from two years of farmer field trials the variety Mongal has been found to be well suited for rainy season cultivation in Burkina Faso.