

Full Length Research Paper

Farm yield evaluation and demonstration of Melkashola tomato variety in central zone of Tigray Region, Ethiopia

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Low production and productivity of tomato in the study area is due to limited use of agricultural inputs, particularly improved seeds and fertilizers. The practice of tomato seed production in central zone of Tigray is almost negligible. The demand for vegetable seed is increasing from time to time. Though vegetable seed production is difficult, there are attempts and efforts to produce them at local level. Strengthening of community based seed multiplication practice is a means to develop the vegetable seed production techniques and business. In order to bring this to practical, this work was conducted in 2013. Farmers research group (FRG) approach was used to implement the research. In 2013, an average yield of 1.2056 q/ha of tomato seed was recorded.

Key words: Tomato, yield, production, seeds, fertilizers.

INTRODUCTION

Tomatoes are among the vegetables identified in the growth and transformation plan (GTP) as a high value vegetable. Tomatoes in Ethiopia are produced mainly in the northern and central rift valley areas. In recent years, commercial tomato production has significantly expanded since national agricultural strategies began, favoring high value cash crops. The total area of land estimated to be covered by tomato farms in 2011/12 marketing year (MY) is 7,255 ha with an estimated yield of 81,970 MT (11.3 MT/ha). Oromia region contributes the lion's share of Ethiopia's total tomato production (56, 279 MT or 68%) with the remaining production coming from Meki (9%),

Tigray (5%) and Somali region (4%). It is estimated that more than 254, 000 farmers are engaged in tomato farming (Quintin et al., 2013).

Export market opportunities and the growing local demand for high quality packed vegetables and fruits have grown. The production of processed fruits and vegetables such as tomato paste and fruit juices for the domestic market and tomato and orange concentrate for export market are viable areas of investment in the country. The daily processing capacities of the privately owned factories range from 1250 to 8000 cans. Currently there are five fruits and vegetables processing plants in

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the country. These plants process limited products, namely; tomato paste, orange marmalade, vegetable soup, frozen vegetables and wine (EFDRE, 2015). The public plant processes about 435 tons per year. One of the privately owned plants is located in North Gondar Zone of Amhara region and the other one is located in Sidama Zone of Southern, Nations, Nationalities and Peoples' Regional State (EIA, 2008).

Melkashola Tomato is an open pollinated variety that is released by Melkassa Agricultural research Center in 1998. It is the most preferable tomato variety by the majority of tomato producing farmers in Ethiopia (Beshir and Boshaiqi, 2012).

Tomato seed production and maintenance requires special techniques and facility requirement activities. The technologies so far developed have not successfully reached on time to the users due to lack of seed multiplication and maintenance as well as distribution scheme in the country. Most farmers are forced to depend on unknown sources of seed which in most cases, are low in quality and adaptability (IAR, 1998).

The seed supply of this crop is not as sufficient as required by the small scale farmers. Most of seeds available in the market are poor in germination and/or uniformity. In the last few years, seed production research has been conducted to identify the production potential of various vegetable cultivars in different agro-climatic regions of the country; some promising results have been obtained. The seeds should be extracted at appropriate time for higher yield and better quality and it must be dried carefully and immediately by maintaining the genetic purity and raising high quality seed through screening and selecting superior tomato cultivars (IAR, 1998).

Tomato seed production has various advantages. Seed producing farmers will be able to increase their own income from unit area of land. The demand of seed in Ethiopia in general and Tigray region in particular is increasing from time to time. Especially in our region, Tigray, there is a remarkable increase in vegetable production as a result of the increased construction of diversions, dams, springs and increased awareness of farmers in horticultural crop production as a means of alleviating poverty as they have high production potential per unit area. And all this necessitates an opportunity for domestic seed production. Therefore, the domestic seed production has advantages over the imported seed, save hard currency for imported seed. Farmers can get seed with low price and reduce risk of unknown pests and diseases, higher adaptability performance and germination percentages. Therefore, it is important to encourage domestic seed production.

However, tomato seed production need a special field treatment and requires more detailed attention and handling as compared to field crops. It is generally influenced by environmental factor such as temperature, light and variety type and in addition to this, farmers have

lack of awareness on seed production techniques. Hence, in areas where there is a potential of tomato production like in our mandate areas, production of tomato seed techniques is very important. Therefore, the objective of this project was to familiarize and demonstrate tomato seed production techniques.

Objectives

1. To evaluate yield performance of Melkashola tomato variety in farmer field.
2. To train farmers on tomato seed extraction techniques in the study area

MATERIALS AND METHODS

Site description

The demonstration was conducted in Tanqua-Abergelle woreda at Shekatekli irrigation scheme. Abergelle is situated in the central zone of the region which is about 120 km from Mekelle, the administrative city of Tigray. It is located 13°14'06"N latitude and 38°58'50"E longitude. It is agro-ecologically characterized as hot to warm sub-moist low land below 1500 m.a.s.l. The mean annual rain fall and temperature is 350 to 700 mm and 24-41°C respectively. The rain fall is erratic and unproductive nature.

Farmers research group establishment

This demonstration was carried out through the participation of farmers. Farmers Research Group (FRG) was established based on interest and willingness of the farmers to adopt new technologies as they may be doubtful for new things unless they participated in working with adaptation of the technology. The tomato variety known as Melkashola is used for this demonstration work. This variety provided 261 Qt/ha fruit yield in adaptation trail conducted by Abergelle Agricultural Research Center in 2009/2010 and 2010/2011 cropping seasons. The seed multiplication was demonstrated in four farmers land in total area of 0.04 ha. Vegetable producing farmers in the study area participated in the monitoring and support and evaluated the yield performance. Not only this but also, training was given to the farmers to make clear understanding on how to grow and produce vegetable seed particularly tomato.

Plant establishment and fermentation process

In nursery site, the seeds were planted in well prepared seed bed and the seed beds were covered or mulched with grass. Application of 92 g/bed P₂O₅ during sowing and 82 g/bed nitrogen during first hoeing of nursery was provided. After 48 days of planting, healthy and vigorous seedlings were transplanted to the field. The spacing between plants and rows was maintained 30 and 80 cm, respectively. After transplanting 200 kg/ha DAP and 100 kg/urea were applied. All of DAP and half of urea were applied during transplanting and half urea were 42 days of transplanting. This demonstration was carried out through the participation of farmers at Sheka Tekli irrigation scheme.

The crop was harvested at the "dead-ripe" stage when the fruit developed full color. In selecting fruit for seed, true-to-type fruits based on typical color, shape, size and internal fruit characteristics



Figure 1. Growth performance of Melkashola Variety at Sheka Tekli irrigation scheme.

Table 1. Days to maturity, total fruit and seed yield of tomato during demonstration.

| Plot | Variety | Days to maturity | total yield (Qt/ha) | Seed yield (kg/ha) |
|------|------------|------------------|---------------------|--------------------|
| 1 | Melkashola | 115 | 499 | 125 |
| 2 | Melkashola | 115 | 500 | 130.2 |
| 3 | Melkashola | 115 | 510 | 127 |
| 4 | Melkashola | 110 | 494.85 | 121 |
| 5 | Melkashola | 122 | 497.9 | 99.6 |
| | Mean | 115.40 | 500.35 | 120.56 |

were considered. In other words, fruits which were off-type, bruised, misshapen, or diseased fruit were removed before the start of seed extraction. During seed processing, the seeds which show undesirable characteristic were removed. The tomato seed were extracted by the most preferred method (fermentation) which is a natural process that is least harmful to the seed and can destroy bacterial canker and other seed-borne diseases. The harvested fruit was break into pulp, seeds, and juice and then the mixture was poured (“mash”) into a large bucket then fermented for three days. The bucket was stirred three times a day to facilitate fermentation process and to prevent the buildup of fungus. After fermentation is complete the seed is separated by washing, the seed was dried. Though the process is quite simple, there are some important details for performing the process properly.

Data collected

In this demonstration, the phenology parameter of maturity date was recorded to train farmers for planned use of land. Total fruit and seed yield per hectare were also recorded to clearly understand the yield performance of the variety at farmers’ level. The days to maturity of the variety were taken from the entire plot observation of each farmers plot and the mean value was taken.

Similarly, the fruit and seed yield performance of the variety was collected in a quadrant. The data were taken in the middle rows of size 3 x 3.5 m between plant and row directions, respectively.

RESULTS AND DISCUSSION

Days to maturity, total fruit and seed yield

The growth and yield performance of Melkashola variety was observed by tomato producing farmers of the study area (Figure 1). As indicated in Table 1, Sheka Tekli irrigation scheme showed high maturity and yield potential of the studied tomato variety (Melkashola).

A day to maturity is the day in which the variety is 80% matured and ready for harvest. Total yield is the yield gain from any commodity both marketable and unmarketable yields (Table 1). In this demonstration, the Melkashola tomato variety matured in 115.40 days. Similarly, Regassa et al. (2012) indicated that Melkashola tomato variety can mature after 100-120 days of

transplanting. Supporting this suggestion, Shushay and Haile (2014) also found that Melkashola matured in 117 days of transplanting. According to Beshir et al. (2009), Melkashola tomato variety can be matured in 100-120 days of transplanting.

The mean total fruit and seed yield obtained was 500.35 and 1.3 Qt/ha, respectively. This fruit yield is 134.45 Qt/ha more than the fruit yield obtained by Shushay and Haile (2014) which was about 335.9 Qt/ha in Humera district. The highest yield obtained in Abergelle district might be due to suitability of environmental conditions (soil and climate) of the area than Humera district. The variety might express its potential yield when the growing conditions are suitable. Yemane (2016) reported that the seed yield of Melkashola tomato variety ranges from 1 to 1.2 Qt/ha. Therefore, the seed yield obtained in this study provided the maximum yield that can be obtained and seed yield and fruit yield are positively related. Melkassa Agricultural research center also reported that the variety has the potential to produce 430 Qt/ha of fruit yield on research farms.

CONCLUSION AND RECOMMENDATION

In this demonstration, improved tomato Melkashola variety that was selected in previous adaptation trail as better performing variety, was used. The variety provided better performance on fruit and seed yield parameters. Therefore, research on other agronomic practices such as fertilizer rate, spacing and irrigation frequency should be conducted to increase yield.

CONFLICT OF INTERESTS

The author has not declared any conflict of interests.

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