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Opportunities and Potential of hot pepper (*Capsicum annuum* L.) production in Ethiopia

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ABSTRACT: *Hot pepper (Capsicum annuum var. L) is the most common Capsicum pepper in Ethiopia. It is growing in different agro ecological conditions leading to economically important variability for improvement. The objective of this review is to study the opportunities and potential of hot pepper production in Ethiopia. Ethiopia has the opportunities of hot pepper production like introduction of new varieties, suitable agro ecology, the expansion of infrastructure, access to foreign markets, and the expansion of technology like telecommunication. Production of hot pepper is limited in many factors like diseases incidence, lack of improved varieties, soil fertility and extension services. Generally, we conclude that Ethiopia has conducive environment for hot pepper production. In future government should have to take the responsibility to improve the production of hot pepper.*

KEY WORDS: - Opportunities, Hot pepper, potential, production, Ethiopia

INTRODUCTION

Hot pepper (Capsicum annuum L.) is the world's most important vegetable after tomato and used as fresh, dried or processed products, as vegetables and spices or condiments (Acquaah, 2004). This crop is prominent cash crop for many developing countries' farmers such as Ethiopia, Nigeria, Ghana, China, India, Pakistan, Bhutan, Indonesia, Cambodia and Thailand (Shih-wen *et al*., 2013). Hot pepper (Capsicum annuum L.) is one of the Capsicum spp. dominates world spice trade; while, sweet pepper has become a popular vegetable and cash crop in the tropics for smallholders (Lin *et al*., 2013). In many areas, pepper is grown predominantly as monocrop and rotated with cereals or legumes, during the main rainy season. However, pockets of production in the dry season using irrigation also found, particularly in the rift valley of Ethiopia (Getahun and Habtie, 2017).

Hot pepper (Capsicum annuum var. annuum) is the most common Capsicum pepper in Ethiopia. Capsicum is a high value crop used as vegetables and spice in Ethiopia. Different pepper types such as bell (sweet) pepper which is non -pungent, chili (mitimita) and hot pepper (berbere) which is pungent are produced in which hot pepper is dominantly produced. It is the main part of the daily diet of most Ethiopian societies. The fine powdered pungent product is an indispensable flavoring and coloring ingredient in the common traditional sauce "Wot", whereas the green pod is consumed as a vegetable with other food items. The average daily consumption of hot pepper by Ethiopian adult is estimated 15g, which is higher than tomatoes and most other vegetables (MARC, 2004). Because of its wide use in Ethiopian diet, the hot pepper is an important traditional crop mainly valued for

its pungency and color. According to (Mohammed *et al*., 2015) research indicated that investment in hot pepper production and other vegetables (Amsalu *et al.*, 2015) is viable enterprise for income generation, poverty alleviation, job creation and improvement of food security to every household. Red pepper is a major spice or condiment and the vegetable crop produced by the majority of smallholder producers in the south, Oromia, and Amhara regions. Despite the fact that the significance of red pepper in Ethiopian economy and current income-generating capacity of red pepper as compared to its magnificent potential in the country had not been given due attention (EEPA,2003). The objective of this review is to investigate the opportunities and potential of hot pepper production in Ethiopia.

LITERATURE REVIEW

Origin and Distribution of Hot pepper

The origin of capsicum species is extended from Mexico in the North to Bolivia in the South of Latin America, where it has been part of human diet since about 7500BC (Purseglove *et al*., 1981). Currently the crop is produced in various countries around the world including India, China, Pakistan, Indonesia, Sri Lanka, Thailand and Japan in Asia and Nigeria, Uganda and Ethiopia in Africa. India and Indonesia have been the largest producers. Currently China is the main producer and exporter in the world.

Taxonomy and Morphology

Hot pepper (Capsicum species) belongs to the Family Solanaceae, Genus Capsicum, and species frutescence L., group of vegetables. Cultivated peppers are all members of the world capsicum species. There are an estimated 1,600 different varieties of pepper throughout the world with five main domesticated species that includes C. annum L., C. frutescens L. C. Chinenses., C. baccatum L., and C. pubescens R. (Bosland *et al*., 2000).

Opportunities of Hot pepper Production in Ethiopia

Ethiopia is considered as a source of pepper diversity, for availability of different commercially known hot pepper types in different agro-ecological parts of the country with specific local names (Rehima, 2006, Shimeles *et al*., 2007).

Because of growing in different agro ecological conditions these species were subjected to many changes, leading to economically important variability for improvement (Poulos, 1994). Therefore, all these species of Capsicum have many cultivated varieties suited to different agro-climatic conditions with considerable genetic variations to different morphological characters (Daniel *et al.*, 2014). The favorable agro-ecology of the area to produce hot pepper is also a good opportunity to boost production and increase demand in the area particularly and generally in the country. Even though cooperatives involvement in red pepper marketing was low at present cooperatives could benefit producers by decreasing the transportation cost and purchase the product at a fair price (Abay, 2010).

There are different pepper varieties introduced to Ethiopia at different times and currently it is becoming one of the most important vegetable crops. It is the most important commercial, industrial and cash crop to the farmers and a source of employment to urban and rural workers. Ethiopia is one of a few countries that produce capsicum oleoresin (red pigment) for export market and ground powder (Berbere). It is important to the processing industries (colouring agent) and in the local dishes (karia and berbre). Moreover, the powder from the dry fruits is used as a spice to yield the desired colour, flavour and pungency to the everyday culinary preparations (Rehima, 2006).

Opportunities of red pepper in Ethiopia were the expansion of infrastructure, access to foreign markets, the expansion of technology like telecommunication, the competitiveness of the products, policy issue, i.e., government provides attention for the product and the availability of demand for red pepper from locally to internationally are considered as an ample to produce it (Abay, 2010).

Cultivation and Importance

Peppers is believed to be the first spice to have been used by human beings and archaeological evidence of pepper aged about 6000 is documented (Hill *et al*., 2013). Hot peppers like most other plants, prefer well drained, moisture holding loam soil (sandy loam) containing some organic matter (Lemma and Edward., 1994). A pH of 6.5-7.5 is suitable and the land should be level to 0.01- 0.03 % slope to allow adequate drainage and prevent root diseases.

In Ethiopia, pepper grows under warm and humid weather conditions and the best fruit is obtained in a temperature 21-27 °C during the daytime and 15-20 °C at night (IAR, 1996). It is extensively grown in most parts of the country, with the major production areas concentrated at altitude of 1100 to 1800 m.a.s.l. (MoARD, 2009). According to Bosland and Votava (2000), sweet pepper and hot pepper, like tomato and eggplant are rich in Vitamins A and C and a good source of B2, potassium, phosphorus and calcium (Anonymous, 1998). It has been found that as hot peppers mature, the Pro-vitamin A (β Carotene) and ascorbic acid increase. This has led to extensive production of hot peppers in some countries for export markets. It has also created a need for the expansion of pepper cultivation in to areas where it has not ever been extensively grown (Beyene and David, 2007).

Pungency in Capsicum is produced by the capsaicinoids, an alkaloid ($C_{18}H_{27}NO_3$) that is produced in glands on the placenta of the fruit. While seeds are not the source of pungency, they occasionally absorb capsaicin because of their proximity to the placenta. No other plant part produces capsaicinoids (Hoffman *et al*., 1983).

Production Status of Pepper in Ethiopia

In Ethiopia, the total area under hot pepper production for dry pod has enhanced to 174,463.62 hectares with the total production of about 3,131,154.28 quintals (CSA, 2020). The total production of red pepper in the country for the year 2019/20 increased in 1.35% than the production year of 2018/19. Vegetables took up about 1.64% of the area under all crops at national level. However, of the total

estimated area under vegetables, the lion share which is about 73.13% and 17.81% was under Red peppers and Ethiopian Cabbage, respectively (CSA,2020).

The world's production area of hot pepper is estimated at 1.8 million hectare with total production of 3.9 million tonnes (FAO, 2016). In spite of its importance, hot pepper production in Ethiopia is stayed as low with a national average yield of 5.9 t/ha for green pod whereas it was 1.8 t/ha for the dry pod (CSA, 2020).

However, in Ethiopia, the crop is cultivated at diverse ecological zones from sea level to 2000 m.a.s.l under rain fed and irrigated conditions. Whereas sweet pepper and chili are grown in lower altitudes relatively in warmer areas than for hot pepper and is mainly grown in state farms for export. Birds'eye chili, which is the most pungent of all the peppers, is not in great demand, though few plants are commonly found around the homesteads in high rain fall warmer areas of the country (MARC, 2003).

In collaboration with regional research centers, and universities, the centers have generated a number of outputs including improved varieties, appropriate agronomic practices and crop protection measures for the vegetable production sector that could be grown in the country both under rain fed and irrigated conditions (Fekadu *et al*., 2008). The demand for specific hot pepper varieties is largely driven by consumers' need and its potential to adapt at specific environmental conditions. However, most Ethiopians have strong attachments to the dark brown 'Mareko' and 'Halaba' types (Rehima, 2006; Girma *et al.,* 2011).

Many local genotypes in Ethiopia have evolved with various plant architecture, fruit characters and reaction to diseases and pests through long years of cultivation and natural hybridization, as a result, different commercially known hot pepper genotypes are cultivated in different parts of the country with specific local names like Mareko Shote, Mareko-Dube, Halaba, Gojeb, Milkaye, Birisheleko, Agarfa, Tedele, etc. (Shimeles *et al*., 2007; Girma *et al*., 2011).

Factors Affecting Hot pepper Production Ethiopia

The decline of hot pepper production is also attributed to poor varieties, poor cultural practices, the prevalence of fungal (blights) and bacterial as well as viral diseases (Fekadu and Dandena, 2006).

There are a number of factors affect the hot pepper production in the Ethiopia. Among these factors lack of extension services, diseases, lack of improved seeds, lack of access to the market center and others like bird attack (Ibsa, 2019). According to Abay (2010), the major production characteristics of hot pepper are low input utilization, poor product quality, poor post-harvest handling, and lack access to services (credit, extension services, road and transport, market information). Producers were not confident to produce red pepper constantly due to the fear of the decrease in price and constrained with the lack of roads to transport outputs to the market (Abay, 2010).

Lack of Improved Variety

Each variety has its own significant effect on yield and yield components, and each variety has its own traits that are part and parcel as quality parameters of the crop (shape, size, color, taste, and pungency). The most important traits among others include number of branches per plant, plant height, number of fruits per plant, days to maturity (count from days of transplanting), dry fruit yield per plant, fruit length, and single fruit weight (Lemma *et al*., 2008).

Diseases Incidence

The diseases causes, rotting of the roots and the underground portion of the stem and in severe conditions causes death, some of them cause small, yellow, slightly raised spots appear on young as well as on older leaves, some attacks the crop at seedling stage, as a result followed by yield loss. Therefore, the control measures includes, the use of cultural practices, resistant varieties, rotation of crops, in the severe case chemical action is relevant (EARO, 2004). The main diseases that directly cause the low yield on pepper are virus complex like Pepper Mottle Virus, Fungal diseases including; damping off (Rhizoctonia solani, Pythium spp., and Fusarium spp), powdery mildew, blight (Phytophthora capsici) and fruit rot (Vermicularia capsici), Bacterial Soft Rot (Erwinia carotovora pv), Rhizoctonia Root Rot (Rhizoctonia solani), bacterial wilt (Pseudomonas solanacearum), anthracnose or Ripe Rot (Collectotrichum capsici) (MoRD, 2009).

Lack of pesticide

Pesticide is one of the anti-biotic chemical uses to kill the pest affect production of different crops. The farmers responded that there are insects look like worms devastating the production of pepper since they could not control some disease thus, it is important to access with pesticide is necessarily an option for them to control some insect and farmers ranked it as fourth challenging factors, but they could not access to this pesticide this finding agrees with (Berhane *et al*., 2016)

Fertilizer requirement

The amount of fertilizer to be applied depends on soil fertility, fertilizer recovery rate, and organic matter, soil mineralization of nitrogen(N), and soil leaching of N (Berke *et al*., 2005). It is believed that phosphorus results in a better yield and more red colored fruit (Matta and Cotter, 1994). During growth, further nitrogen may be applied to achieve more yields. Fertilizer requirements vary with soil type and previous crop history. And thus, a balanced nutrient level is required for maximum production. In Ethiopia, the recommended fertilizer rate for the red or hot pepper is, 200 kg/ha DAP and 100 kg/ha for UREA (EARO, 2004).

CONCLUSIONS AND RECOMMENDATIONS

Pepper is produced in most part of Ethiopia. Even though, hot pepper productions are limited by extension services, disease incidence, lack of improved varieties and low soil fertility. However, opportunities of hot pepper productions are the expansion of infrastructure, access to foreign markets, the expansion of technology like telecommunication, the competitiveness of the products.

Generally, Ethiopia has suitable agro ecology and potential to produce hot pepper. So, we conclude that Ethiopia can produce more than the current production and productivity if she used all package for productions.

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