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Research Article

Review on Effects of Inter and Intra Row Spacing on Production of Garlic (Allium Sativum L.)

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Abstract

Garlic is propagated by means of cloves and this vegetative propagation leads to infection by several viruses, which are called garlic viral complex. Planting density is one of the main factors that have an important role in the growth, yield, and quality of onions. Garlic yield mostly depends on the number of plants per unit area. Increase in yield and for bulb grade improvement planting garlic at proper spacing is considered a necessary practice. Considering the importance of garlic as one of the potential vegetable crops for both domestic consumption and export, it is imperative to increase its productivity along with appropriate use of inter and intra-row spacing. Therefore the review is undertaken to review the status of the optimum inter and intra-row spacing for garlic production. The Latin term for garlic is allium. It belongs to the monocot group of flowering plants known as the onion genus. The number of plants per square foot has a major impact on garlic yield. Garlic planting at the right spacing is thought to be a crucial practice for improving bulb quality and productivity. The low production of garlic in Ethiopia is caused by a variety of biotic and abiotic problems, including ineffective fertilizer application, diminishing soil fertility, improper agronomic techniques, and improper inter- and intra-row spacing. Planting distance is regarded as a crucial management strategy in the production of garlic. Reviewing the best inter- and intra-row spacing for garlic production is the goal.

Keywords

Garlic, Spacing, Growth, Yield and Quality

1. Introduction

Garlic is propagated by means of cloves and this vegetative propagation leads to infection by several viruses, which are called garlic viral complex [7]. In Ethiopia, garlic is one of the important bulb crops grown and used as a spice or a condiment throughout the country. It also has many medicinal properties [1]. Planting density is one of the main factors that have an important role in the growth, yield, and quality of onions [13]. Garlic yield mostly depends on the number of plants per unit area. Increase in yield and for bulb grade improvement planting garlic at proper spacing is considered a necessary practice. Garlic production and bulb yield could be improved through the application of manures and proper spacing. The planting spacing is considered an important management practice in garlic production [11]. There is of shortage of information on specified plant spacing, agronomic practice, and lack of improved variety, inappropriate disease, pest management, and geographical /environmental/ challenges. Accordingly that the garlic production in Ethiopia is low [8].

If the plants are densely planted they may not get

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sufficient nutrients due to great competition between them. Once more if far away than optimum space the land will be left without productivity [8]. The garlic cloves are sown in well-prepared soil at a depth of 5 cm with seed to seed spacing of 7.5 cm. Row-to-row spacing is kept at 10 to 15 cm [6]. Considering the importance of garlic as one of the potential vegetable crops for both domestic consumption and export, it is imperative to increase its productivity along with appropriate use of inter and intra-row spacing. Therefore the review is undertaken to review the status of the optimum inter and intra-row spacing for garlic production.

2. Literature Review

2.1. Effect of Intern and Intra-Row Spacing on Growth Parameter of Garlic

The highest plant height was recorded by treatment 3 (8 cm), which had an average mean of plant height (37.32 cm) [8]. In general highest plant height was recorded from the narrowest plant spacing [12, 2, 8]. This might be due to competition for light at high plant population density. But at wider spacing due to less competition for light and other resources, plants remained unaffected by plant density [8].

Plant population density of the onion increased from 25 plants m^2 to 50 plants m^2, plant heights at maturity remained statistically non-significant. However, as the plant population density increased plant heights diminished significantly. In general, the height of onion plants decreased by about 32% with an increase in plant population density from 25 plants m^2 to 200 plants m^2 [14].

The greatest plant height may be due to the availability of free access to environmental resources (water, nutrient, and light) for the plants in the wider plants [5]. Plant height decreases with increasing plant spacing. The maximum plant height was recorded from a plot planted with 10 cm spacing, whereas minimum plant height was observed in plots planted with 20 cm spacing [2].

The highest leaf length of onion was obtained at wider intra-row spacing and the shortest at narrow intra-row spacing [8]. Leaf length showed decreasing trend as intra row spacing increased. As spacing between plants increases leaf length also increases [8]. There was a linear increase in leaf length of garlic with an increase in intra-row spacing [10].

2.2. Effect of Intern and Intra-Row Spacing on Yield Parameters of Garlic

The increased average bulb weight with increasing intra-row spacing might be due to less competition associated with widely spaced plants resulting in heavier bulb weight per plant. The result is in line with the findings of [15] who noticed that onion mean bulb weight increases with increasing intra-row spacing.

When Increment of intra row spacing increase the bulb weight of the plant [9]. Varying planting spacing significantly affected bulb weight and increasing planting density significantly decreases bulb weight [4]. Total bulb weight and mean bulb weight were also significantly affected by plant spacing, where 10 cm plant spacing gave a highly significant total bulb weight and mean bulb weight over the 5 cm plant spacing treatments [3].

The probable reason for minimum bulb diameter in closer row spacing might be due to the competition of plants for nutrients, moisture, and sunshine [2]. This might be due to the lowest spacing that might intensify the nutrient competition and might result in high disease severity [9].

2.3. Effect of Intern and Intra-Row Spacing on Quality Parameter of Garlic

The bulb weight of garlic was significantly affected by spacing and increasing intra-row spacing from 10 to 20 cm significantly increased bulb weight. The reason for this might be due to the lowest spacing might increase nutrient competition as well as increasing disease severity [9].

The highest total bulb yield gave a 76.23% yield advantage over the lowest ones. Moreover, the pooled mean result indicated that double planting inters and intra spacing of 40 and 5 cm, respectively gave a high yield of onion in both the total and marketable bulb yield [5].

The increment of bulb yield at closer spacing might be ascribed to the increase in plant population per unit land area, while the decrease in bulb yield at wider intra-row spacing could be associated with decreased plant population per unit land area. It can thus be explained that the bulb yield per plant area depended not only on the performance of individual plants but also on the number of plants per unit area as confirmed in this study [9]. The result explained that the total bulb yield of the garlic was decreased with wider spacing as compared to closer plantation. The probable reason for higher yield in the closed plantation was due to more plants in closer plants [2].

3. Summery

Garlic (Allium sativum L.) belongs to the family Alliaceae. The garlic crops originated from Central Asia. Allium is the Latin word for garlic. It is part of a monocot genus of flowering plants. The genus includes approximately 500 species, including edible onions. Garlic is a medicinal plant. Garlic is propagated using cloves. In Ethiopia, Garlic is one of the important bulb bulbs used is as a spice or a condiment. The yield and quality of bulbs can be influenced by cultural practices and growing environments. Garlic yield mostly depends on the number of plants per unit area. Garlic production and bulb yield could be improved by using proper

spacing. The use of inappropriate plant spacing could be reducing the yield and yield component of garlic considerably. There is a shortage of information on specified plant spacing, location change, soil fertility, and so on. Considering the importance of garlic as one of the potential vegetable crops, it is imperative to increase its productivity with the appropriate use of inter and intra-row spacing. So the review is undertaken to investigate the effects of different intra-row and inter-row spacing on the productivity of garlic. Accordingly, the aim of this review is the status of the optimum inter and intra-row spacing for garlic production.

As the spacing between plants increases leaf length also increases. Bulb size, Bulb weight, and Bulb diameter increase with the increase in spacing. The total bulb yield of the garlic was deceased as the increment of Intra row spacing. Bulb weight of garlic was significantly affected by spacing and Increasing intra-row spacing from 10 to 20 cm significantly increased bulb weight. Bulb weight and clove weight significantly increased with wider row spacing. Double planting inters and intra spacing of 40 and 5 cm, respectively gave a high yield of onion in both the total and marketable bulb yield.

Author Contributions

Mandefro Gebre Hibstu is the sole author. The author read and approved the final manuscript.

Conflicts of Interest

The author declares no conflicts of interest.

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