

Comparison of Different Garlic (*Allium Sativum*) Varieties for Yield and Yield Components Grown at Agriculture Research Station, Buner



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Abstract

Different Garlic varieties i.e. (Garlic-1, Swat White, NARC-1 and Buner Local) were tested for Yield and Yield Components" at Agriculture Research Station, Buner during the year 2018. The results showed significant difference in the major parameters. The mean maximum bulb diameter (56.0 mm) and maximum Yield (8.6ton ha⁻¹) was recorded in the variety Buner Local while the mean minimum Bulb diameter (51.8mm), number of cloves bulb⁻¹ (5.2) and minimum yield (1.7ton ha⁻¹) was noted in NARC-1. NARC-1 was prominent in stem diameter (13.5), single clove weight (13.6) and bulb weight (73.0) but could not beat Buner local in unit yield. The mean minimum bulb weight (58.0g) and single clove weight (4.5g) was recorded in variety Swat White and Garlic-1 respectively. Based on results, it is concluded that Buner Local expressed the best results in yield and yield components as compared to other Garlic varieties, and therefore recommended for general cultivation in Buner environment.

Keywords: *Allium sativum*; Varieties; Yield Components; Comparison

Introduction

Garlic (*Allium sativum* L.) belongs to the family Alliaceae. Among cultivated alliums Garlic is the 2nd most widely used vegetable after onion (*Allium cepa*). Magaji [1] Garlic is grown for its edible bulbs. The bulbs can be eaten fresh, cooked, processed or saved for seed Hannan and Sorensen [2]. The garlic bulb contains small bulb lets called as cloves. The crop can be grown on both rain-fed and irrigated conditions. Garlic is a perennial and cold crop which requires high nutrient and water. Ahmadu [3]. The Garlic growing countries Includes China, India Spain, Egypt, Korean Republic, Argentina, Italy and the United States. (FAO, 2011). China is the leading producing country of Garlic. (FAO, 2014). The Garlic occupied in Pakistan 7973 ha of area in the year 2014-15 with the 72987 tons of production. While occupied 2818 ha area in KP with the production of 34167 tones. (MNFSR, 2014-15). In District Buner during 2013-14 the yield of Garlic was recorded as 7451 kg ha⁻¹ (Govt of KP, 2013-14). Garlic has a great importance due to its medicinal value and is used for curing of various diseases such as stomach diseases, sore eyes, and ear ache etc. It also contains minerals and Vitamins Kumar [4]. Garlic is a rich source of volatile compounds, which are responsible for the distinct flavor and the bioactive properties of dry bulbs Kimbaris [5]. It is used in the 1st World War as a natural antiseptic Gene [6]. Garlic is used chiefly as a condiment Purselove [7]. The oil

of garlic is volatile and has sulfur combining compounds which is responsible for strong odor, its unique flavor and pungency as well as for healthful benefits Salomon [8].

The garlic extracts tests in vitro have proved that they can aggregation of human body platelets to form clot which have to potential for arterial blocking Block [9]. Garlic is one of the high value vegetable crops produced during the cold season, in rotation with pulses that have contributed in breaking the life cycle of pest problems and improve soil fertility Gebremedhin [10]. Garlic is a basic flavoring in many types of dishes ranging from vegetable soup, meat, salad, tomato combination, spaghetti, sausages and pickles Brewster [11]. Many people perceived and appreciated garlic for its many medicinal attributes Rabinowitch and Currah [12]. At off season the same quantity of garlic is usually sold at twice or three times the value of onion Getachew and Asfaw [13]. The portions of the garlic plant which is above the ground are also sometimes consumed, mostly while immature and tender Wikipedia [14]. The wild relative of garlic "*Allium vineale*" that occurs in North America which is commonly called as "wild garlic" USDA [15]. The parts of the plant used pharmaceutically include fresh bulbs, dried bulbs, and oil extracted from the garlic UMM, [16]. Colors of the Garlic bulb can range from white to red, purple or pink Innvista [17]. Garlic presents no pollination issue

and when flowers appear on garlic they are sterile so seeds are unknown. Both are propagated by bulblets or cloves Mann [18]. Just before to planting, bulbs are broken apart into individual, unpeeled cloves which should be planted 3-4 inches deep, about 4 inches apart in the row. Care must be taken to lineup the cloves within the row to keep foliage uniformly arranged in the rows to facilitate cultivation. If cloves are planted with the flattened side's perpendicular to the axis of the row, the leaves will all develop in the plane of the row. This makes mechanical cultivation much easier. In situations where hand cultivation is to be used in dense plantings, the angled sides of the clove should be planted parallel to the plane of the row so that the leaves will emerge perpendicular in the row, allowing plants to be spaced closer without leaf interference Voigt [19]. To plant garlic properly, dig a hole or trench, place the unpeeled clove gently into the hole with the pointed side up (the scar [stem] end down) and cover the clove with soil. Setting the cloves in an upright position ensures a straight neck McLaurin [20].

Bulbs of Garlic will usually begin to be ready for harvest from late June to July, depending on garlic variety and where you are, geographically Voigt [19]. Some people like to heavily irrigate at the pre-planting phase in drier climates, to help build a winter deep soil moisture reserve. The garlic store [21] Irrigation should be stopped at least two weeks prior to the expected harvest date. Late-season irrigation tends to stain the skins and reduce quality Goldy [22]. When grown on fertile well-drained and sand or silt-loam soils it gives good result. The requirement of Nitrogen to Garlic is 5% N, 4% N, and 3% N at pre-bulbing, bulbing, and post-bulbing stages, separately K Tyler [23]. *Puccinia allii* (Garlic Rust) a fungal disease infects garlic at bulb formation stage Timila [24]. The fungal disease and insects badly affect the crop yield and over all bulb quality of the Garlic throughout the world Pinto [25]. The per hectare yield of garlic can be increased by following the proper package practices like planting timely, space properly, and judicious application of irrigation water, and besides these balance application of nitrogen plays a vital role in the development of garlic A Kakar [26]. The Garlic crop is more susceptible to rust disease when the plantation is enough close because more moisture is retained within the leaves as well as close canopy of plants also prevents the entrance of direct sunshine Jorind [27]. The bulb yield of Garlic can be increases with the higher plant population but it had also the adverse effect on bulb uniformity and disease incidence Liasas and Fernandez [28]. This low yield of garlic may to be due to the lack of improved Agronomic practices, lack of improved and adaptable varieties, low soil fertility, diseases, insect pests and lack of post-harvest technologies Debrezeit [29]. Harvest the garlic when 1/3 to 1/2 of the leaves have died back in this manner McLaurin [20]. It has higher nutritive value than other bulb crops in addition to containing antibiotics like garlicin and allistatin Maly [30]. It is essential to select land with high fertility or to apply considerable quantities of manure or fertilizers to obtain good yields CVR [31]. Garlic is an obligate apomictic plant and is primarily propagated asexually by cloves Jones and Mann [32].

Objectives

- a) To identify the high yielding and environmentally suitable garlic varieties/cultivars for the study area.
- b) To test the suitability and productivity of better performing varieties elsewhere in district Buner.

Materials and Methods

The Experiment trail was laid out in (RCBD) Randomized Complete Block Design with one factor replicated three times. The plant to plant and row to row distance were kept 10 cm and 25 cm respectively. The total area of the field was 153 m². The Evaluation study consisted of one factor, i.e. variety evaluation. The following varieties were studied:

V₁: Garlic-1

V₂: Swat White

V₃: NARC-1

V₄: Buner Local

Parameters Studied

The following parameters were studied during the Experimental trail:

The stem diameter and bulb diameter were recorded with the help of digital Vernier caliper in millimeter, the number of cloves bulb⁻¹ were counted manually, while the bulb weight and yield ton ha⁻¹ was measured with the help of digital balance in grams and the single clove weight in grams were recorded by dividing the bulb weight on total number of cloves. All the Bulbs are collected randomly from each replication and then the mean was calculated. The data collected on various parameters was subjected to analysis of variance (ANOVA) to observe the difference between treatments. In case when the difference was significant, they were promote evaluated for difference through least significant differences (LSD) test. Statistics 8.1 software was applied for calculating both ANOVA and LSD (Steels and Torre, 1980) at 5% level of probability.

Results and Discussion

The trail work on the "Comparison of Different Garlic Varieties for Yield and Yield Components" was carried out in the Agriculture Research Station, Buner during 2018. The data regarding parameters are discussed in the following paragraphs.

Stem Diameter (mm)

The data regarding the mean values for stem diameter in millimeter of different varieties of Garlic in Table 1 shows a significant difference observed in stem diameter of different varieties. The mean values shown that maximum stem diameter (13.5 mm) was noted in variety NARC-1 followed by variety Swat White (8.9 mm) and variety Garlic-1 (8.5 mm) one-to-one, while the minimum stem diameter (8.2 mm) was noted in Buner local variety. All the three varieties are statistically alike to each other

except variety NARC-1. The extreme stem diameter of NARC-1 might be owing to the hereditary makeup of the variety.

Table 1: Stem diameter (mm), Bulb diameter (mm) and Number of Clove Bulb⁻¹ Comparison table of Different Garlic (*Allium sativum*) Varieties for Yield and Yield Components grown at Agriculture Research Station, Buner.

Treatments	Stem Diameter (mm)	Bulb Diameter (mm)	Number of Clove Bulb ⁻¹
V ₁ , Garlic-1	8.5 b	53.2 a	12.7 a
V ₂ , Swat White	8.9 b	53.5 a	11.4 a
V ₃ , NARC-1	13.5 a	51.8 a	5.2 b
V ₄ , Buner Local	8.2 b	56.0 a	12.1 a
LSD = (0.05)	0.8458	3.5238	1.0033
C.V (%)	10.56	8.04	11.83
P. Value	0.0022	0.7003	0.0009

Bulb Diameter (mm)

The data concerning the mean values for bulb diameter in millimeter of different varieties of Garlic are shown in Table 1. There is no significant variation in bulb diameter of different varieties. The mean values revealed that maximum bulb diameter (56.0mm) was noted in variety Buner Local followed by variety Swat White (53.5 mm) and variety Garlic-1 (53.2mm) respectively, while the minimum bulb diameter (51.8 mm) was recorded by variety NARC-1. All the three varieties are statistically similar to each other. Similar results were noted by that the plant spacing in Garlic increases the bulb diameter (mm) ranging from 60.66 to 67.33 mm.

Number of Cloves Bulb⁻¹

The data about the mean values for number of cloves bulb⁻¹ of different varieties of Garlic are given in Table 1. There is a clear significant variation in number of cloves bulb⁻¹ of different varieties. The mean values show that a greater number of cloves bulb⁻¹ (12.7) was noted in variety Garlic-1 followed by variety Buner Local (12.1) and variety Swat White (11.4) respectively, while the smaller number of cloves bulb⁻¹ (5.2) was recorded by variety NARC-1. All the three varieties are statistically similar to each other except NARC-1 variety. Similar results were obtained by that the total number of Clove bulb¹ is from 9.63 to 12.51, according to him the highest number of Clove bulb⁻¹ (12.51) was observed with 20 cm plant spacing as compared to minimum of 9.63 Clove bulb¹ in a plot planted with 10 cm plant spacing. It might be due to the heredity characters of the varieties.

Bulb Weight (g)

The data about the mean values for bulb weight in grams of different varieties of Garlic are given in Table 2. There is no significant variation in bulb weight of different varieties. The bulb weight were taken in grams. The mean values reflect that the maximum bulb weight (73.0 g) was noted in variety NARC-1 followed by variety Buner Local (65.0 g) and variety Garlic-1 (59.0 g) respectively, while the minimum bulb weight (58.0 g) was recorded by variety Swat White. All the varieties are statistically

similar to each other. Results also testify that the weight of Garlic Bulb from 74.66 to 99.33 was noted by in grams. The difference in weight of the bulbs might be due to the absorption of the different nutrients as well as also might be due to the environmental condition requirements of the different Garlic varieties [32-35].

Table 2: Bulb Weight (g), Single Clove Weight (g) and Yield (ton ha⁻¹) Comparison table of Different Garlic (*Allium sativum*) Varieties for Yield and Yield Components grown at Agriculture Research Station, Buner.

Treatments	Bulb Weight (g)	Single Clove Weight (g)	Yield (ton ha ⁻¹)
V ₁ , Garlic-1	59.1 a	4.5 b	3.7 a
V ₂ , Swat White	58.0 a	5.1 b	11.4 a
V ₃ , NARC-1	73.0 a	13.6 a	5.2 b
V ₄ , Buner Local	65.0 a	5.2 b	12.1 a
LSD = (0.05)	6.9071	0.5579	1.0033
C.V (%)	13.26	9.56	11.83
P. Value	0.2195	0.0000	0.0009

Single Clove Weight (g)

The data relating the mean values for single clove weight in grams of different varieties of Garlic are given in Table 2. There is a highly significant variation in single clove weight about different varieties of Garlic. The mean values explains us that the maximum clove weight (13.6 g) was noted in variety NARC-1 followed by variety Buner Local (5.2 g) and then after that by the variety Swat White (5.1 g) respectively, on the other hand the minimum clove weight (4.5 g) was obtained by variety Garlic-1. Apart from NARC-1 all the other three varieties are statistically similar to each other. The results was supported by the finding of that the maximum clove weight (11.65 g) was prominent in plot planted with 20 cm plant spacing, while minimum clove weight (09.84 g) was detected in plot planted with 10 cm row spacing. The variety NARC-1 has less number of cloves that's why having high clove weight.

Yield (ton ha⁻¹)

The data regarding the mean values for yield in ton/ha of different varieties of Garlic are given in Table 2. The mean table shows a clear picture of significant difference which were observed in yield of different varieties. The mean values shown that maximum yield (8.6 ton ha⁻¹) was noted by variety Buner Local followed by variety Swat White (5.0 ton ha⁻¹) and variety Garlic-1 (3.8 ton ha⁻¹) respectively, while the minimum yield (1.7 ton ha⁻¹) was noted in NARC-1 variety. The variety Garlic-1 and Swat White are statistically similar to each other. The variation in yield of the varieties might be due to the genetic factors of the varieties as well as might be due to the differences in the fertility level of the field.

Summary

An experimental trail "Comparison of Different Garlic Varieties for Yield and Yield Components" were carried out at Agriculture Research Station, Buner during 2018. Agricultural Research Station, Buner is a multi-disciplined organization involved in research to increase agricultural production of the area through

developing high yielding, pest resistant crop varieties and better manufacture skill suitable for the agro-ecological environment of District Buner. Four different varieties of Garlic i.e. (Garlic-1, Swat White, NARC-1 and Buner Local) were compared. The experiment was laid out on (RCBD) Randomized Complete Block Design having three replications. The experimental data were noted on Stem Diameter (mm), Bulb Diameter (mm), Number of cloves bulb⁻¹, Bulb weight (g), Single Clove Weight (g) and Yield (ton ha⁻¹).

The results showed significant difference in the studied attributes of the garlic varieties. The maximum stem diameter (13.5 mm) was noted by the variety NARC-1 followed by variety Swat White and Garlic-1 (8.9 mm, 8.5 mm) respectively while the minimum stem diameter (8.2 mm) was noted by the variety Buner Local. The data revealed that the maximum bulb diameter (56.0 mm) was recorded by the variety Buner Local which were followed by the variety swat white (53.5 mm) and Garlic-1 (53.2 mm) on the other hand the minimum bulb diameter (51.8 mm) was noted by the variety NARC-1. The results regarding the number of cloves bulb⁻¹ shows that the more number of cloves bulb⁻¹ were reported by the variety Garlic-1 (12.7) which were followed by the variety Buner Local (12.1) and then by the variety Swat White (11.4) while the less number of cloves bulb⁻¹ were recorded by the NARC-1 variety which is (5.2) the first three varieties are statistically similar to each other. The data about the bulb weight represents us that the maximum bulb weight (73.0 g) were noted by the variety NARC-1 followed by the variety Buner Local (65.0 g) and Garlic-1 (59.0) respectively, while the minimum bulb weight (58.0 g) were recorded by the Swat White variety. The results about the single clove weight shows highly significant difference the maximum single clove weight were noted by the variety NARC-1 (13.6 g) which is followed by the variety Buner Local (5.2 g) and by the variety Swat White (5.1 g) while the minimum single clove weight (4.5 g) were recorded by the variety Garlic-1, except NARC-1 all the three varieties are statistically similar among each other. The table about the yield (ton ha⁻¹) shows that the more yield were recorded by the variety Buner Local (8.6 ton ha⁻¹) followed by the variety Swat White (5.0 ton ha⁻¹) and Garlic-1 (3.8 ton ha⁻¹) while the minimum yield was recorded by the variety NARC-1 (1.7 ton ha⁻¹).

Conclusion

In the study attributes about the Stem Diameter (mm), number of cloves bulb⁻¹, single clove weight (g) and yield (ton ha⁻¹) the data showed a significant difference. On the basis of the results obtained the following conclusions are made. The mean maximum Bulb diameter (56.0 mm) and mean maximum yield (8.6ton ha⁻¹) was recorded by the variety Buner Local.

Recommendation

On the basis of the above conclusions the variety Buner Local could be recommended for farmer's community in District Buner as it shows best results among the tested Garlic varieties at Agriculture Research Station, Buner.

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