

*Original Articles*

- Study of Evaluation of Four Varieties of Onion (*Allium cepa L*) in the Environment of UST, Bannu  
**Abdul Malik, Rehman Ullah Khan, Saad Ullah Khan, Syed Aneel Gilani, Hidayat Ullah Khan, Zeeshan Ahmad**..... 01
- Antimicrobial Activity of Shilajit  
**Aliya Hayat, Fatima Sher Ali** ..... 10
- Oral Health Status, The Level of Oral Microbial Flora in Healthy Girls  
**Sughra Hasan, Amna Shafiq, Aziz Fatima, Sayyada Ghufrana Nadeem**..... 13
- Detection of Du Antigen in Rh Negative Blood Group Individuals  
**Naheed Afshan, Sarah Tariq** ..... 16
- Bioethics Education, Awareness of Ethics and Dissemination of Knowledge among Teachers and Students  
**Saima Rasool, Sumaira Javed, Sayyada Ghufrana Nadeem, Shazia Tabassum Hakim**.....20
- Effect of Burn Injury on the Dissemination of *Candida albicans* from the Skin of Mouse  
**Qudsia Hussain, Amna Shafiq, Shazia Tabassum Hakim, Sayyada Ghufrana Nadeem** .....33
- Effect of Cadmium Levels on the Growth Curve of *Candida albicans*  
**Aziz Fatima, Qudsia Hussain, Shazia Tabassum Hakim, Sayyada Ghufrana Nadeem** .....38
- Phosphatase Production among *Candida Species*  
**Syeda Hira Batool, Sayyada Ghufrana Nadeem** ..... 42
- Effect of Paneer Booti During Kinetics on Candida  
**Tuba Batool, Sayyada Ghufrana Nadeem**..... 49
- Prevalence of Transfusion Transmitted Infection in Replacement and Voluntary Blood Donor  
**Syeda Kanwal Zehra, Saira Bano, Shazia Tabassum Hakim, Sayyada Ghufrana Nadeem**.....56
- Prevalence and Risk factors for Diabetes mellitus in Urban Population of Karachi (A Short Study)  
**Sobia Jawaid, Sayyada Ghufrana Nadeem**..... 64
- Anti-Proliferative Effect of Arsenic, Cadmium and Lead on Human Placental Cells  
**Aftab Ahmad, Aamina Shahm, Abdul Rauf Shakoori**..... 67

*Review Articles*

- Expression of Growth Form Factors during Morphogenesis in *Candida albicans*  
**Amna Shafiq, Aziz Fatima, Qudsia Hussain, Sayyada Ghufrana Nadeem, Shazia Tabassum Hakim**..... 75

*Instruction To Authors*

## Study of Evaluation of Four Varieties of Onion (*Allium cepa* L) in the Environment of UST, Bannu.

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### ABSTRACT

A field experiment was conducted to evaluate the performance of different varieties, viz; Bannu Local, India, Swat and Quata of Onion at Awais Ahmad Ghani Green House, Department of Botany, University of Science and Technology Bannu, K.P.K Pakistan. The trial was conducted in RCBD (Randomized Complete Block Design) and replicated 3 times to minimize the error. Significant differences were recorded among varieties for the parameters like New Leaf Initiation, Leaf Length plant-1, Leaves bulb-1. While non-significant results were recorded in case of Fresh Biomass plant-1, Dry Biomass plant-1, Economic weight bulb-1, Bulb Diameter, Yield Kg hac-1. So far as the performance of Quata variety is concerned it taken the highest number of days (24) for new leaf initiation after transplantation and longest leaf length (25.50cm) was observed in this variety. Maximum Fresh Biomass (259.6 g plant-1), Dry Biomass (218.6 g plant-1), Economic Weight (210.1 g plant-1), Bulb Diameter (7.2cm) and Yield (17149.850 kg h-1) was found in case of Swat variety in the prevailing environment. As for as the potential and efficiency of the Bannu Local variety is concerned, it produced the higher number of leaves bulb-1 (26.7), while minimum value in all the parameters regarding yield components was observed for India variety. In the light of this effort, Swat variety was recorded the best and most suitable for the environment like Bannu.

**Key words:** Biomass, Leaf bulb, Onion, Swat.

### INTRODUCTION

Onion (*Allium cepa* L.) is most important cool season plant, it hold top position in area of cultivation and production amongst the bulb crops produced in the world (FAO 2002). *Allium cepa* is known only in cultivation, Grubben & Denton (2004). Onion is the chief food plant in which food is stored in a bulb. It is very old, its use going back over 4000 year beyond the beginning of authentic history. It is unknown in wild state the onion is probably a native of Southern Asia or Mediterranean region. It has long been valued in China and India for its flavoring.

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Onions are cultivated over large areas in temperate region and even in tropical climates. They prefer cool moist regions with a sandy soil. They are grown from seeds or small bulblets. Onion should be dried prior to storage to develop the characteristic flavor and test, which are due to an acrid volatile oil, the allyl sulphide. They are both food plants and flavoring agents. Over 250 species of *Allium* are known. Many occur as weeds. The commonest forms in cultivation are Garlic, leeks, chives, shallots, and the true onion, Hill (1951).

Onion is a shallow rooted crop a fairly high concentration of nutrient should normally be

maintained at the surface of the soil for its optimum growth and yield. The importance of urea, phosphate fertilizer and potash fertilizer on the growth and yields of vegetable crops are well-known. Onion genotypes vary in their nature of bulbing with wide range of production of yield parameters and yield, Islam *et al.*, (2007). There is no doubt that mineral fertilizers are essential in most cropping system if maximum yields are to be realized. However in long-term field experiments where mineral fertilizers have only been used, soil structure has been deteriorated and crop yield steadily decreased as reviewed by Ristimaki *et al.*, (2000).

In Pakistan the cultivation of onion is not uncommon, it is cultivated through out the Pakistan, especially in irrigated area or where water is abundant. Different cultivars are cultivated in different area of Pakistan. The cultivars, which are in practice in Bannu and Nurang region, are Naurang local, Panyalla local, Phulkara, Shah Alam local, Swat, Bannu local and India etc.

One of the main problems in cultivation of onion is proper and adequate amount of water and use of proper amount of fertilizer, selection of fertilizer's type and its method of application. Our present work illustrate the evaluation of four (4) varieties of onion i.e. India, Swat, Local Bannu, Quata on the basis of various yield parameters by using urea and DAP.

## MATERIALS AND METHODS

The small bulbelts or set of all the varieties of onion were sown in the green house area of main campus UST, Bannu during the year 2010. The varieties are: V1 Local Bannu, V2 India, V3 Swat, V4 Quata

The germplasm of all the varieties have been developed and maintain by private formers in their own fields. V1 and V4 were obtained from the field of sperka wazir FR Bannu maintained by Mir Shahid Ullah, V2 was obtained from the field of Ghulam Muhammad Tatar Khel Karak, while V3 was maintained by Mujeeb Ur Rehman Zabbi Karak. I

transplanted all of these varieties as early as possible at 5 January 2010 to my experimental field of clay loam soil, due to effectiveness of early transplant. All the plots were irrigated thoroughly and adequately from well. Similar and equal dose of NP fertilizer was maintained in all the varieties to evaluate their actual performance against the prevailing condition. The fertilizer was used in three splits in Top-Dressing method.

The experimental field was arranged in four replications with Randomized Complete Block Design. The measurement of experimental field was kept as 9x2.4 and was split out in to four rows with row to row distance 60 cm while plant to plant distance 50 cm. Each replication was composed of four sub plots. Each sub plot contained 80 plants, i.e. 20 plants in each row. In this way the total area along with 4 replications was 14 m x 11.1 m. Total sub plots were 16 and each plot of 3 m x 2.4 m and thus the total number of plants were 1280,320 of each variety.

*Statistical analysis:* The data so collected for each parameter were averaged and was subjected to statistical analysis as proposed by Steel and Terrie (1980).

When significant results were obtained for all parameters then L S D tests were applied for comparison among the means of treatment. All the results were compared at 5% probability level. The actual data was recorded in each treatment on the following parameters.

*Data recorded on following parameters:* 1:- New leaf initiation, 2:- Leaf length, 3:- Fresh weight (Biomass) of whole Plant, 4:- Dry weight (Biomass) of whole plant, 5:- Dry weight (Economic weight) of Bulb, 6:- Diameter of Bulb, 7:- Leaves Bulb-1, 8:- Yield Kg ha-1:

## RESULTS AND DISCUSSION

*Analysis of Variance:* The results of the analysis of

variance indicate that the mean differences among the different varieties are highly significant for the parameters studied viz., Days to New Leaf Initiation, Leaf Length and Leaves bulb-1 (Appendix 1, 2 and 7). In case of parameter like, Fresh Biomass, Dry Biomass plant-1, Economic Weight bulb-1, Bulb Diameter and Yield Kg/h<sup>-1</sup> are non significant. The mean values for each parameter are shown in Table I - VIII, while the graphic representations are highlighted in Fig No. 01-08.

The success of any crop lies in the constant vigilance and improvement through selection and evaluation for the individual plants, which is considered necessary for the synthesis of physiologically efficient and biologically superior strains showing promise of increased production per unit area per unit time under a given set of environmental conditions. To achieve these objectives, a comprehensive knowledge of the evaluation mechanism of the control of various parameters in different varieties of the Onion crop under the prevailing environmental conditions have been greatly advocated by a large number of plant scientists like Nourai (1992), Rajcumar (1997), Mohanty (2001), Cheema (2003), Jilani and Ghafoor (2003), Benkeblia (2005), Nourai (2006), Shaheen *et al.*, (2007), Halvorson *et al.*, (2008), Goussous *et al.*, (2009) Jotangee (2010), Schroeder *et al.*, (2010) and Shaheen *et al.*, (2011).

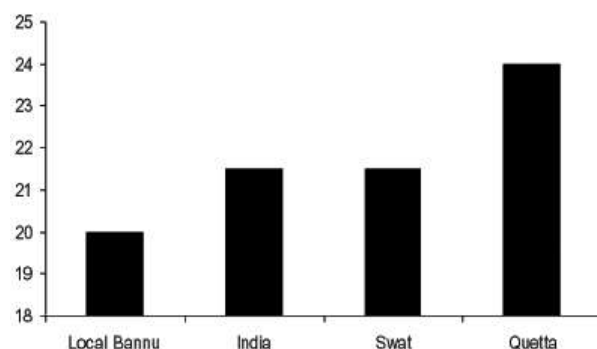
**1. New leaf initiation:** A reference to Table No.I and Fig. 01 with regard to leaf initiation reflects that the Quata variety does extremely well then the other hybrids dyed with recital of 24 days, while the India variety and swat variety both ranked second by 21.5 days. Moreover Local Bannu implemented most minuscule with 20 days. All the varieties were raised in akin environmental condition and were maintained with required agronomical practices.

The local Bannu variety responds maximally to the new situation after transplant and were not affected by new environment, so that starting growth and leading the other varieties. The Quata variety does not established themselves to the new condition

quickly so having minor range of adaptation or may slowly and gradually adopt itself to the new surroundings. The difference is not due to smaller nature of transplant and not differentiation in size all the plants were transferred at 4th leaves stage. New leaf initiation in the new field is not the only criteria in varieties evaluation, but it indicates quick and better adoptable characteristics. Day taken to new leaf initiation depends on the genetic make up of variety and also on adaptation to the environment. The cultural practices also influence the growth of cultivar.

**Table I.** New leaf initiation.

Varieties	Mean in days
Bannu local	20.0a
India	21.5b
Swat	21.5b
Quetta	24.0a
LSD Value	1.131



**Figure 1.** Effect of different varieties of onion on leaf initiation.

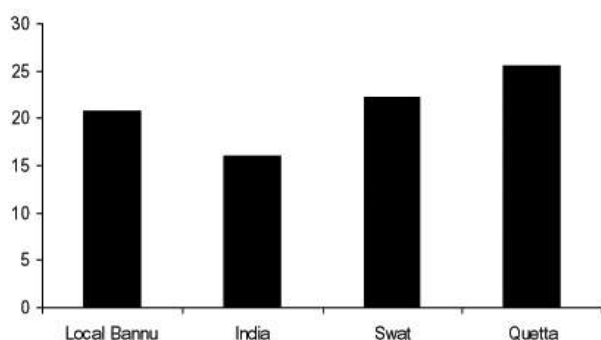
**2. Leaf length:** Data with reference to the leaf length is highlighted in the Table No.II and Fig. 02. Which depicts that leaf length is extensively pretentious by different sources of varieties. The data proved that Quata variety presented the category first with set highest length of 25.50 inches followed by Swat variety with leaf height of 22.25 inches. The least possible length of 16 inches is graded to India, in

the customary ecological conditions and crop growing procedures along with required maintenance. So far as the finding with reference to the research work is concerned is based on the highest leaf length found per plant including the neck. The leaf length shows the photosynthetic activity of plant. The plant having more leaf length is more photosynthetic in general but this is not always true, because the leaf width and nature of cells also play a vital role in photosynthesis.

The results achieved have similarities to some extent with the finding of Jilani and Ghafoor (2003), While contradiction with Mohanty, Prusti (2001) and Ishwari *et al.*, (2006). Such type of contradiction might be due to differences in genotype make up of the varieties but Ishwari obtained non significant differences in height due to genotype and showed that transplanting date is effective in this regard. The differences and similarities may be due to environment and agricultural practices.

**Table II.** Leaf Length

Varieties	Mean in inches
Bannu local	20.75b
India	16.0c
Swat	22.25b
Quetta	25.50a
LSD Value	2.625



**Figure 2.** Effect of different varieties of onion in leaf length

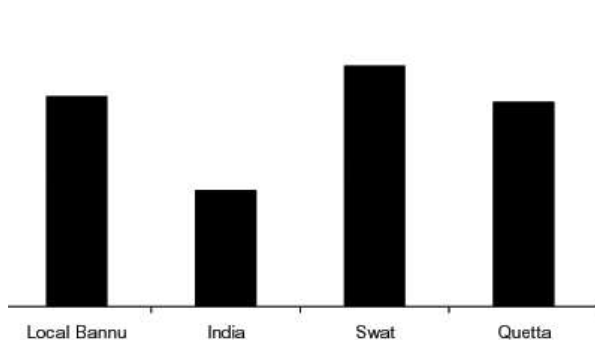
**3. Fresh Biomass plant-1:** An examination of data in Table No. III and Fig. 03 confirms that fresh biomass is not radically affected by the varieties of

onion. Mean value revealed that Swat variety acts best with denomination of 259.6 gm while plant-1 least weight of 125.8 gm is found in India variety. Local Bannu variety achieves second position by rank on the basis of performance in the prevailing environment and agronomical practices. Fresh biomass depends on all contents including water and other volatile substances. The fresh biomass may be greater for one variety while the dry biomass for another means that there is more water in the variety under study. The results so concluded confirm the finding of Shaheen *et al.*, (2007).

The differences and similarities may be due to differences in germplasm sources and also due to different environmental conditions. Irrigation of field also plays an important role in it but basically the water retention property of leaves of the variety is also significant.

**Table III.** Fresh Biomass

Varieties	Mean in gm
Local Bannu	225.8a
India	125.8a
Swat	259.6a
Quetta	221.2a
LSD Value	106.5



**Figure 3.** Effect of different varieties of onion in fresh biomass

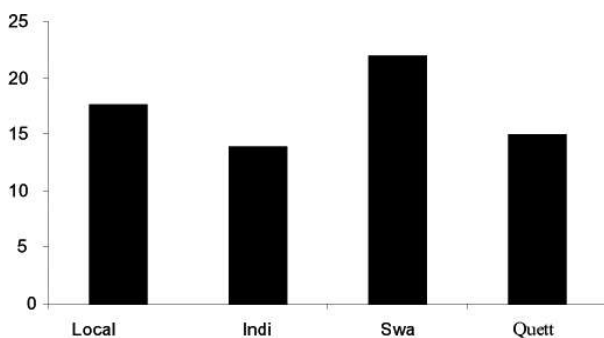
**4. Dry Biomass:** A perusal of Table No. IV and Fig. 04 indicate the Dry biomass bulb-1. Numerical study shows non significant execution of genetically traits,

in contrast to the fundamental setting and analogous agricultural rehearsal. Swat variety secured the top most status with weight of 218.6gm and Local Bannu variety go along with Swat variety by merit of 175.7gm. The smallest value of weight is recorded as 138.5gm by India variety.

The finding so far concluded by me contradicts the finding of Cheema *et al.*, (2003) who evaluated different varieties of onion in one trial under Faisalabad condition and in another trial under different ecological zone of Punjab. There are valuable differences in single plant weight in different varieties in same localities and even differences he recorded for same variety in different condition e.g. pulkara variety was noted with 68.50gm in one area while 86.67gm in another location by him. This type of contradiction might be due to different genetic materials and climatic conditions under which these experiments are performed.

**Table IV.** Dry Biomass

Varieties	Mean in gm
Local Bannu	175.7a
India	138.5a
Swat	218.6a
Quetta	149.2a
LSD Value	89.11



**Figure 4.** Effect of different varieties of onion in Dry Biomass

*5. Economic weight/bulb:* Facts about the economic weight are expressed in Table No. V and Fig. 05. Swat variety surpassed rest of the varieties tinted

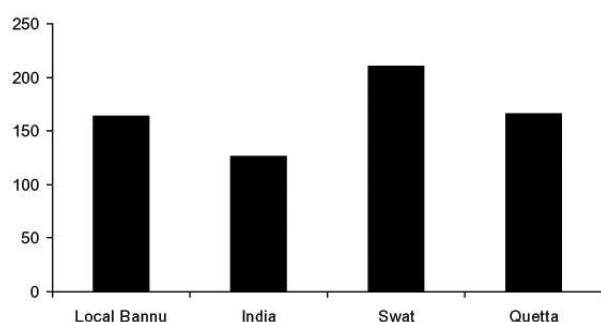
with utmost weight of 210.1 gm, while the India variety documented the bare minimum eight of 125.8 gm. In addition Quata verity attained the subsequent attitude to swat variety with charge of 165.6 gm weight. So the swat variety secured the climax on the bases of functioning versus the existing environment and parallel crop growing condition.

Bulb weight influence the yield ha<sup>-1</sup> higher the bulb weight more will be the yield ha<sup>-1</sup>. Such types of findings are already reported by Iqbal *et al.*, (2000) who noted that bulb weight affect the yield ha<sup>-1</sup> as the bulb has significant interaction with yield. The results so achieved here are in contradiction with Coolong *et al.*, (2008) who reported that yield is not increased by large size bulb as Wala Wala and Ailsa Craig two large bulb variety produce lower yield. Similar results were also concluded by Shimabuku *et al.*, (1980) in their evaluation study of 15 varieties at different elevation. Mr. Max showed equivalency in bulb weight in both the elevation of 2000 and 1200 ft. the great effect of elevation on Bulb Weight was observed in yel-granex/RCS-1903, RCS-1004, Rio Bravo and savannah. The varieties mentioned in the previous line show maximum performance at 2000 elevation while minimum at 1200 elevation. Cheema *et al.*, (2003), also reported similar finding during varieties evaluation they found high bulb weight for 606 cal and Ac-383-1.

**Table V.** Economic weight

Varieties	Mean in gm
Local Bannu	163.2b
India	125.8b
Swat	210.1a
Quetta	165.6b
LSD Value	1.177

The deviation in present findings may be due to different germplasm of cultivars, environmental factors and also agronomical practices.



**Figure 5.** Effect of different varieties of onion in Economic weight

**6. Bulb diameter:** Analysis of the data revealed that bulb diameter is not significantly affected by the diversity of onion varieties as indicate in Table No. VI and Fig. 06. Swat variety ranked first by diameter of 7.2 cm, while second position is maintained by both local Bannu variety and Quata variety with the diameter of 6.6 cm. The minimum diameter of 5.9cm is gained by India variety, in the prevailing environment and other required agricultural practices.

The bulb diameter depends upon not only on the number of leaves bulb-1 but also on the thickness of rings of leaves and criteria of the researcher. Many workers either do not mention their criteria or does not distinguish b/w bulb size and shape. Onion bulbs are not completely spherical they are of two basic shapes either vertically elongated or horizontally elongated, for that reason the accurate diameter is equal to vertical diameter plus horizontal diameter divided by 2.

$$\text{Diameter} = \frac{\text{Vertical diameter} + \text{horizontal Diameter}}{2}$$

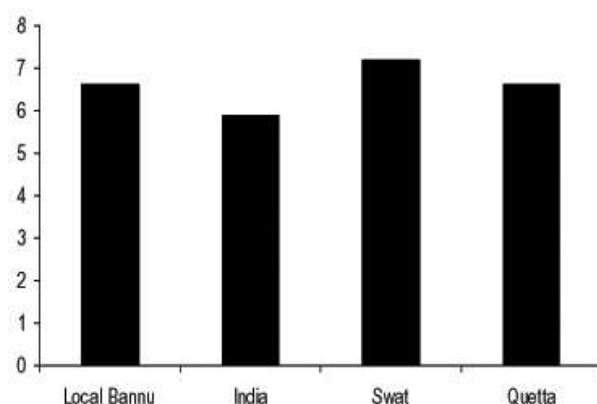
The work regarding the parameter of Bulb diameter of this study is also supported by Martinez *et al.*, (2005). Likewise the results are in contradiction to the finding of Hasegawa *et al.*, (2001) who worked out on the comparison of nine F1 hybrid varieties with eight local varieties.

Such type of fluctuation in research findings might be due to variation of germplasm of varieties of onion utilized and the difference in the ecological

setup. The agronomic practices also influence the crops in various ways.

**Table VI.** Bulb diameter

Varieties	Mean in cm
Local Bannu	6.6b
India	5.9c
Swat	7.2a
Quetta	6.6b
LSD Value	1.177



**Figure 6.** Effect of different varieties of onion in Bulb diameter

**7. Leaves bulb-1:** The information regarding the parameter like leaves bulb-1 is exposed in Table No. VII and Fig. 07 which indicate that less number of leaves i.e.19.8 per bulb is noted in India variety and Local Bannu variety is noted for 26.7 leaves per bulb. At the other hand Swat variety is recorded for 25 Leaves per bulb and thus occupied the position next to the Local Bannu variety. In this way Local Bannu variety achieving the top most position in comparison to all the other varieties in the current study.

It is necessary to mention that leaves per bulb is directly related to the diameter of the bulb and each variety differ from another in having rings bulb-1, no matter each variety has specific thickness of rings which contribute to the diameter also The rings of

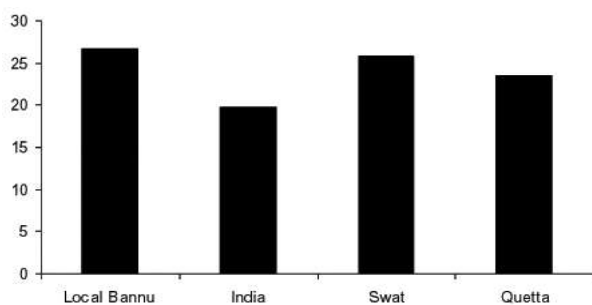
leaves are of two types the outer tunica leaves which may be from 2-4 leaves and inner fleshy leaves in present study both type of leaves are estimated collectively in the leaves bulb-1.

The finding regarding the leave bulb-1 is contradicting from the report of Cheema *et al.*, (2003) who stated that all the cultivars are not radically influenced by different location for leaves bulb-1. While the results published by Anisuzzaman *et al.*, (2009) are in full agreement to the finding of me who recorded differences in number of leaves at different plantation time.

The differences may be due to different locality, soil and agricultural practices and temperature as Anisuzzaman reported correlation of vegetables growth with temperature, he concluded that cool temperature and fully sunny day promote vegetative growth.

**Table VII.** Number of Leaves bulb-1

Varieties	Means
Bannu Local	26.7a
India	19.8c
Swat	25.8a
Quetta	23.5b
LSD Value	1.852



**Figure 7.** Effect of different varieties of onion in Leaves\bulb

**8. Yield Kg h<sup>-1</sup>:** So far as the performance of the varieties is concerned on the basis of kg h<sup>-1</sup> the variety Swat excelled rest of the varieties with mean performance of 17149.85 kg h<sup>-1</sup> while the India variety was recorded with minimum performance

of 10264.75 kg h<sup>-1</sup>. Further more the Quata variety reflected the second position with value of 13517.10 kg h<sup>-1</sup> and thus Bannu local variety was ranked third on the basis of performance against the prevailing environment and similar agronomical practices.

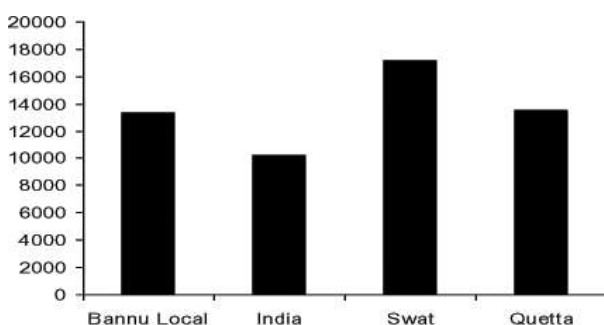
The results achieved so far for the parameter of yield (kg/h<sup>-1</sup>) is concerned are not in confirmation with the work of Nelson (1986) who recorded 25.05 tons acre-1 for all the varieties in average, but to some extent in conformity with Rajcumar (1997) who worked on the performance of different varieties, he recorded significant differentiation in yield in different cultivars, which range from 8.4-38.7 tons h<sup>-1</sup>. More over, the data of the current study is apposite to Nourai (1992), who recorded significant differences due to seasonal changes and shows that long water intervals of irrigation reduce the yield. While similar with Mohanty and Prusti (2001) who observed highest yield of 21.06 ton h<sup>-1</sup> for Kalyan variety. Shah and Ishtiaq (2002) evaluated different varieties in swat valley and reported highest yield for Rio Zorro (86.44 tons h<sup>-1</sup>) and minimum for contessa (23.57 tons h<sup>-1</sup>).

The physical environment influence the yield h<sup>-1</sup>, but the gen pools are quite effective in this regard. The total yield is not affected by large size bulb as Walla Walla and Ailsa Craig two large bulb varieties studied for lower yield when planted in spring due to diseases, but are suitable for fall planting. So season is also effecting, some variety more then the other as reported in the above line by Coolong *et al.*, (2008).

**Table VIII.** Yield Kg h<sup>-1</sup>:

Varieties	Means kg h <sup>-1</sup>
Bannu Local	13323.200b
India	10264.750c
Swat	17149.850a
Quetta	13517.100b
LSD Value	6710





**Figure 8.** Effect of different varieties of onion in Yield Kg h<sup>-1</sup>

### CONCLUSION AND RECOMMENDATION

As a result of fore going discussion it is concluded that: Quata variety take maximum days (24 days) in adaptation to the new surrounding after transplant. The maximum leaf length (25.50 inches) is recorded in Quata variety while the Swat variety produce maximum Fresh Biomass (259.6 gm), Dry Biomass (218.6 gm), Economic Weight (210.1 gm), Bulb Diameter (7.2 cm) and Yield hector-1 (17149.850 kg ha<sup>-1</sup>). The Bannu local variety has higher number of leaves (26.7) bulb-1.

From the above conclusion following recommendation may be offered for the guidance of future research worker; Swat variety is suitable for higher yield and yield contributing parameters. The Bannu local variety for more number of leaves bulb-1 and Quata variety for longer leaf. So Swat variety is suggested for cultivation in the local area of the Bannu for higher yield and yield contributing parameters.

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