



Green manures incorporation effect on varieties yield and yield attributes of maize

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Abstract

The study was carried out during 2018 at Agronomy Research Farm, The University of Agriculture Peshawar. Four green manures incorporation (Contro, Pigeon pea, Sesbania and Sun hemp). Varieties i.e. Pahari, Azam, Jalal and Iqbal were taken as a second factor for the experiment. Green manures were incorporated in the corresponding plots one month before sowing and at the stage of the flowering. The study was conducted in Randomized complete block (RCBD) design with four replications. Experimental results exhibited that application incorporation of green manuring have significant effect on yield attributes of maize. Maximum emergence m^{-2} (8.3), taller plant (176.6 cm), maximum leaf area (452.9 cm^2), more 100 seeds weight (24.8 g), maximum stover yield ($5070.6 \text{ kg ha}^{-1}$), maximum grain yield ($3789.7 \text{ kg ha}^{-1}$), maximum biological yield ($13149.3 \text{ kg ha}^{-1}$) were observed with the treatment of incorporation of pigeon pea. Varieties have significant effect on emergence m^{-2} , plant height, grain yield and biological yield. Maximum emergence m^{-2} (9.1) was observed in Pihari variety. Maximum plant height (179.7 cm) was obtained from the variety of Jalal. Maximum grain yield ($3686.5 \text{ kg ha}^{-1}$) and maximum biological yield ($12335.8 \text{ kg ha}^{-1}$) were recorded in the Azam variety. It is concluded that application of incorporation of green manures, especially pigeon pea produced higher yield and its attributes and also the variety Azam of maize crop has produced maximum yield and thus recommended for the agro climatic conditions of Peshawar.

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Introduction

Maize is third most essential crops in case of its yield and intake after rice (*Oryza sativa* L.) and wheat (*Triticum aestivum* L.). Its yield was enlarged since 2000 to 2008 by 46%, by means of only rise in zone by 6% (GOP, 2009). Conversely with the increases in population rate its yield desires to be improved to nourish increasing population. Maize is mainly growing in two spells the central summer crop and the spring season crop. Mutually the seasons have durations of approximately 3-4 months. Typically open-pollinated cultivars of maize existed in the area (Harris *et al.*, 2007).

Integration of manure is measured as a prime substrate for renewal of organic matters in the soil (Rasool *et al.*, 2007); (Gangwar *et al.*, 2006) and able to be considered as another approach of fertilizers addition to enhance productivity of crop and fertility of soil (Blair *et al.*, 2006). Nevertheless, there is not sufficient information on the influence of treatment of manure in addition to nitrogen fertilizer, mostly in Pakistan silt, loam and clay. Thus, a field research was performed with the hypothesis of varieties and yield attributes of maize as influenced by diverse sources of organic fertilizers.

Pakistan has remained lessening in spite of augmented reactions of fertilizers, pesticides and due to the consumption of artificial varieties, which have fewer potential as associated to the hybrid corn during the previous decade (Njeru, 1983). The potential of somewhat variety can solitary be entirely consumes by sensible usage of inputs, appropriate safety measures and enough irrigations at crucial stages. Therefore, latest attention in manuring, farmyard manure and significance of green manuring has re-emerged because of the use of high prices fertilizers as all types of manures keeping long-term productivity of soil further gathering timely nutrients necessity. Also the use of organic manures with combination with inorganic fertilizers urea have a positive interaction (Bocchi and Tano 1994).

Green manuring comprise leaves, stems, chaffs, roots

and any extra plant fragment that persist harvested or grazed after agricultural crops. (Balasubrahmanian N & Nnadi 1978) mentioned residues of crop as harvest residues like stovers, straws, haulms and managed waste. Residues of plant and biomass set up a significant resource, as after the decomposition they have a potential of maintaining fertility of soil (Nottidge *et al.*, 2010). Management of crop residue with admiration to the number and superiority of applied biomass to the soil, has a major impression on quality of soil and resilience as thriving as agronomic productivity (Udeata, 2008).

Aims of the research

The main aims of the research was to find out the best green manure for incorporation.

To find out the best variety capable for sowing in agro climatic condition of Peshawar.

To find out the interactive effect of green manure incorporation and varieties.

Materials and methods

Experimental location

Varieties and yield attributes of maize as influenced by diverse sources of organic fertilizers was measured in a field research in the year of 2018. The research was performed at Agronomy Research Farm of The University of Agriculture, Peshawar Pakistan.

Incorporation of green manures

Green manures crops Pigeon pea, *Susbania* and Sun hemp were sown on the corresponding plots. Once the green manures crops reaches at the flowering stage the crops were harvested and were incorporated by rotavator in their corresponding plots. After the incorporation of green manures the sowing of main crop i.e. maize was practiced.

Materials and treatments

Seed of maize varieties (Iqbal, Jalal, Azam and Pihari) were got from The Agricultural Research Farm of The University of Agriculture, Peshawar Pakistan. The experiential treatments were arranged in such a case

that treatment 1 was taken as a control, treatment 2 was pigeon pea application, treatment 3 carried sesbania and treatment 4 includes sun hemp. A control without fertilizer and manure was too involved in each of the replication. An experiment was set up in Randomized Complete Block design containing three replications. The area of plot was 3m × 5 m with 4 rows 75 cm apart with 5 meter length. Green manures were incorporated one month before sowing in the soil. Before sowing. All cultural and agronomic applications and practices including hoeing, irrigation and weeding were performed regularly in each replication for all the treatments.

Statistical analysis

The data will be analysed statistically according the methods concerning to randomized complete block design (RCBD) having split plot arrangement. Level of significance for mean was calculated by using least significance differences (LSD) test at 5% of significance (Steel *et al.*, 1997).

Results and discussion

Emergence m^{-2}

Data on emergence m^{-2} of maize as influenced by incorporation of green manures and varieties is shown in Fig. 1. Statistical analysis indicates the significant influence of green manure incorporation and varieties on emergence m^{-2} . Higher emergence m^{-2} of (8.3) was observed from the treatment of pigeon pea incorporation followed by emergence m^{-2} of (8.0) from the treatment of sun hemp incorporation compared with lower emergence m^{-2} of (7.5) from the control. Maximum emergence m^{-2} of (9.1) was recorded in the Pihari variety followed by emergence m^{-2} of (8.8) from Azam variety compared with minimum emergence m^{-2} of (6.0) from Iqbal variety. These differences indicated the existence of variability among tested cultivars.

This variability might be attributed to genetic and environmental factor. Similar results were reported by (Khalafalla, 1993).

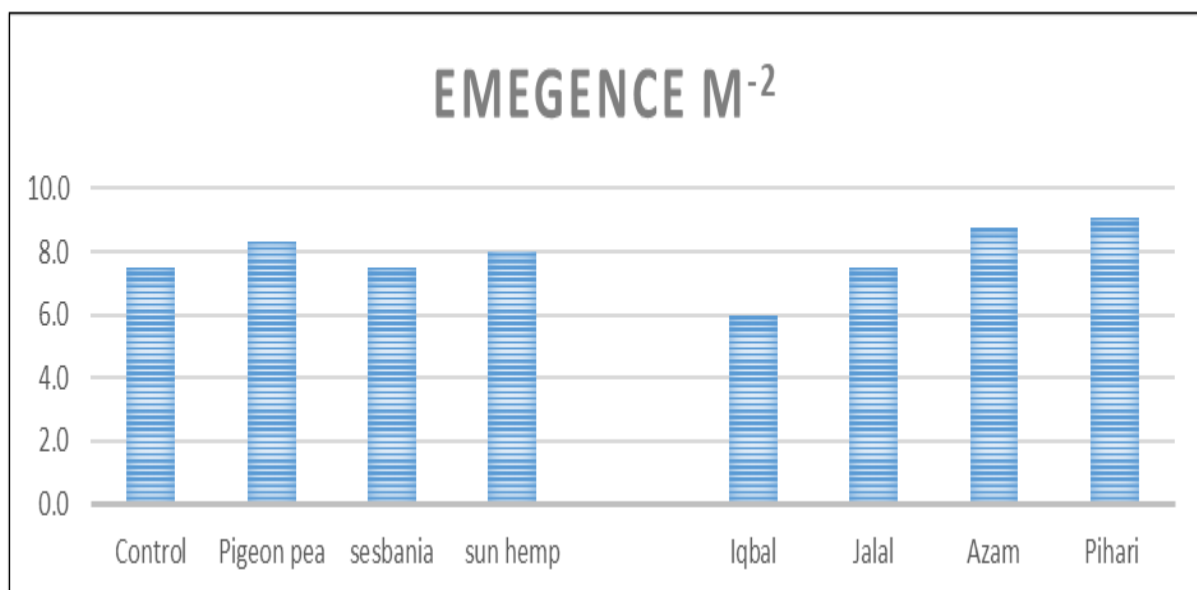


Fig. 1. Emergence m^{-2} of maize as affected by green manures incorporation and varieites.

Plant height (cm)

Plant height of maize as affected by incorporation of green manures and varieties is given in Fig. 2. Statistical analysis indicates the significant outcome of incorporation of green manures and varieties on plant height. The interaction of green manures incorporation and varieties was found significant.

Taller plants of (176.6 cm) was observed from the treatment of pigeon pea incorporation followed by taller plant of (175.7 cm) from the treatment of sun hemp incorporation compared with shorter plant of (158.7 cm) from the control. Maximum plant height of (179.7 cm) was noted in the Jalal variety followed by plant height of (174.9 cm) from Azam variety

compared with shorter plant of (156 cm) from Iqbal variety. Varieties produced different plant heights. (Thakur *et al.*, 1997) reported that due to more nitrogen availability, crop leads to better vegetative phase and has increased the extension of internodes and shading.

Leaf area cm^2

Leaf area of maize as influenced by incorporation of green manures and varieties is shown in Fig. 3. Statistical analysis indicates the significant conclusion of green manures incorporation on leaf area.

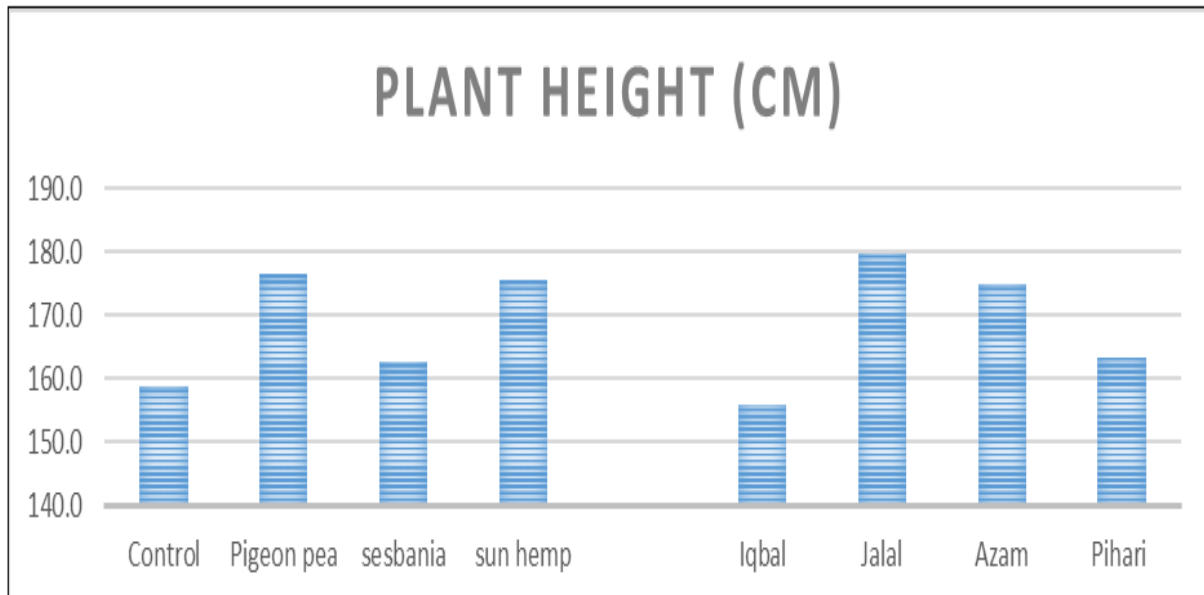


Fig. 2. Plant height of maize as affected by green manures incorporation and varieites.

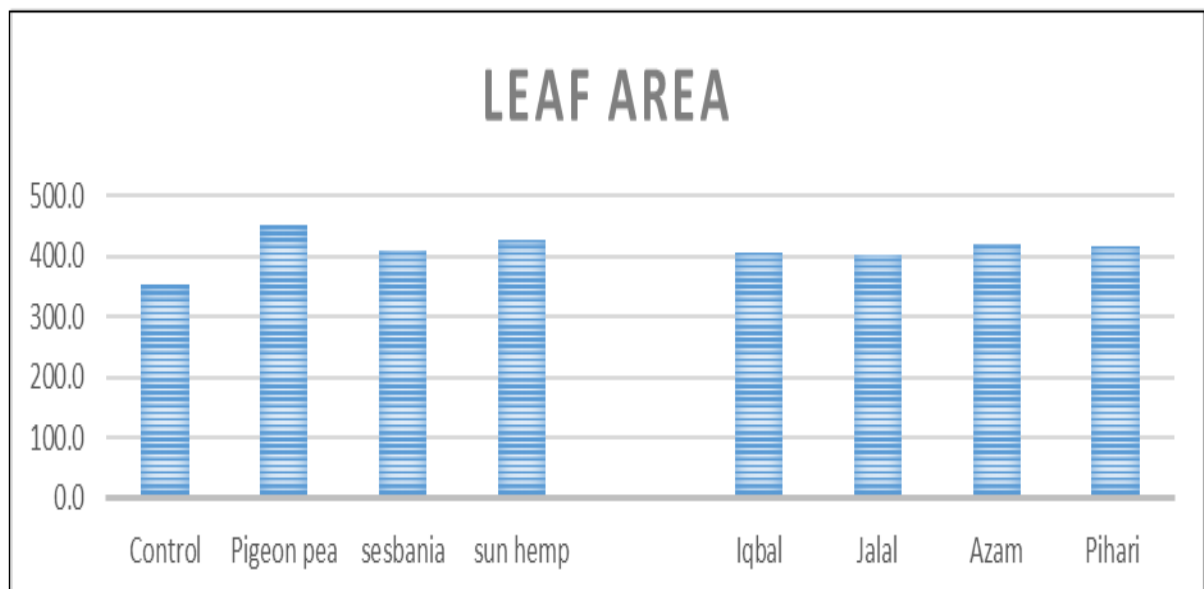


Fig. 3. Leaf area of maize as affected by green manures incorporation and varieites.

The interaction of green manures incorporation and varieties was found significant. More leaf area of (452 cm^2) was calculated from the treatment of pigeon pea followed by leaf area of (428 cm^2) from the treatment of sun hemp compared with minimum leaf area of

(353.2 cm^2) from the control. The influence of varieties on leaf area was found non-significant. Leaf area variation may be due to height of the corresponding variety as reported in the results of (Nottidge *et al.*, 2010).

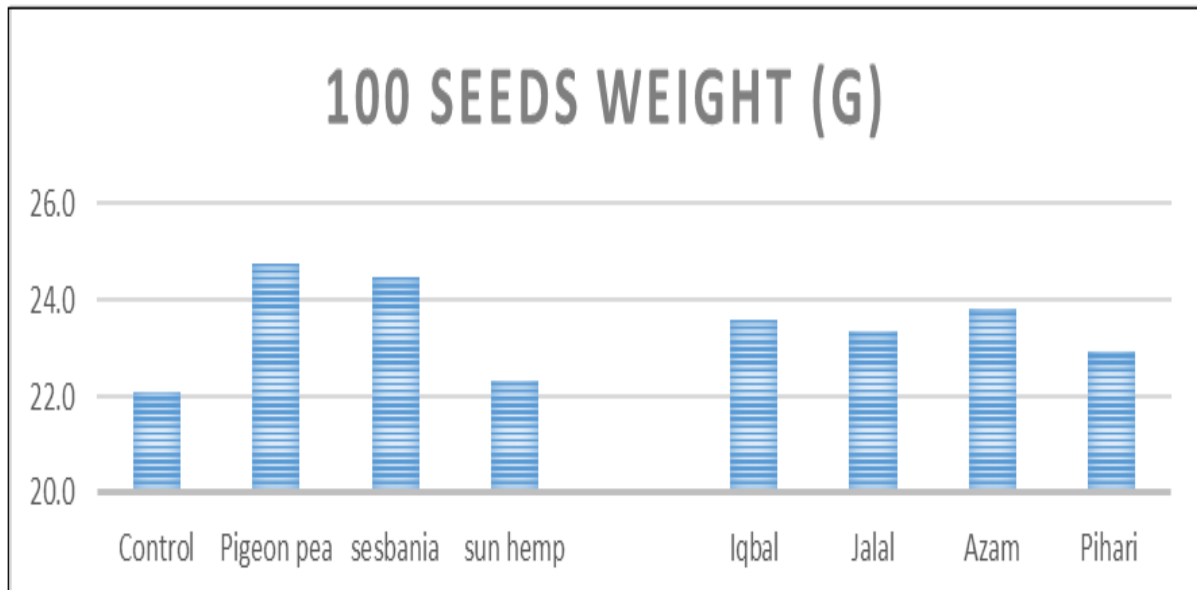


Fig. 4. 100-seeds weight of maize as affected by green manures incorporation and varieties.

100 seeds weight (g)

100 seeds weight of maize as influenced by incorporation of green manures and varieties is given in Fig. 4. Statistical analysis indicates the significant result of incorporation of green manures on 100 seeds weight of maize. The interaction of green manures incorporation and varieties was found significant. Maximum 100 seeds weight of (24.8 g) was observed

from the treatment of incorporation of pigeon pea followed by 100 seeds weight of (24.5 g) from the treatment of sesbania incorporation compared with minimum 100 seeds weight of (22.1 g) from the control. The effect of varieties on leaf area was found non-significant. Increase in thousand grain weight of certain genotypes was affected by the availability of nutrients (Shah *et al.*, 2009).

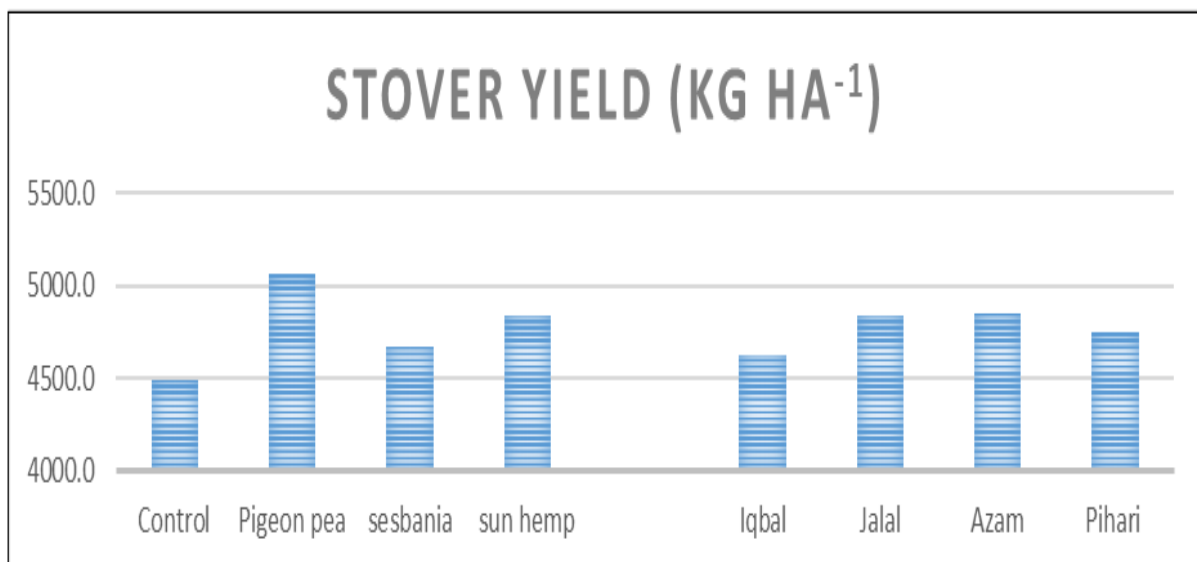


Fig. 5. Stover yield of maize as affected by green manures incorporation and varieties.

Stover yield (kg ha⁻¹)

Data regarding maize stover yield as influenced by incorporation of green manures and varieties is shown in Fig. 5. Statistical analysis indicates the

significant result of green manures incorporation on stover yield of maize. The interaction of green manures incorporation and varieties was found significant. Higher stover yield of (5070.6 kg ha⁻¹) was

observed from the treatment of incorporation of pigeon pea followed by stover yield of ($4834.1 \text{ kg ha}^{-1}$) from the treatment of sun hemp compared with minimum stover yield of ($4488.3 \text{ kg ha}^{-1}$) from the control. The outcomes of varieties on maize stover

yield was non-significant. Augmented growth rate due to greater leaf area index improvement in the plots comprising of manure might be other causes for biological yield advancement (Carpenter and Board, 1997).

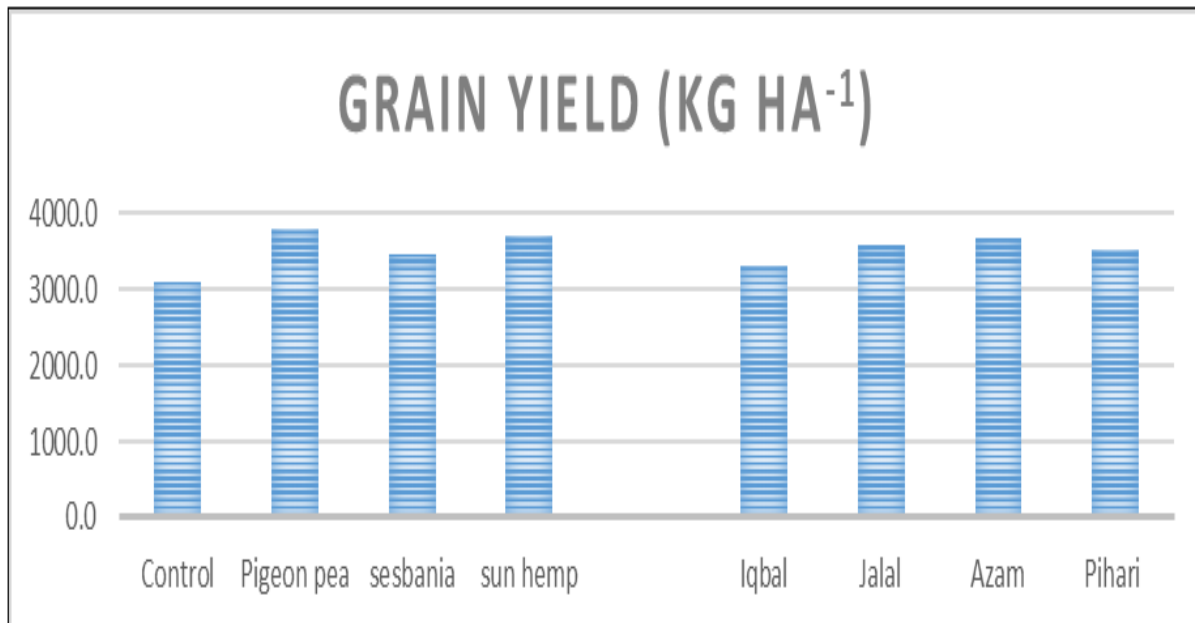


Fig. 6. Grain yield of maize as affected by green manures incorporation and varieties.

Grain yield (kg ha^{-1})

Data on maize grain yield as affected by incorporation of green manures and varieties is given in Fig. 6. Statistical analysis indicates the significant conclusion of green manures incorporation and varieties on grain yield of maize. The interaction of incorporation of green manures and varieties was also found significant. Maximum grain yield of ($3789.7 \text{ kg ha}^{-1}$) was observed from the treatment of pigeon pea incorporation followed by grain yield of ($3719.6 \text{ kg ha}^{-1}$) from the treatment of sun hemp compared with minimum grain yield of ($3112.8 \text{ kg ha}^{-1}$) from the control. Maximum grain yield of ($3686.5 \text{ kg ha}^{-1}$) was observed from the variety Azam followed by grain yield of ($3582.5 \text{ kg ha}^{-1}$) from the variety Jalal compared with minimum grain yield of (3299 kg ha^{-1}) from the variety of Iqbal. This might be due to the incorporation of residues which enhance water content of the soil, enhanced availability of nutrient and defense from losses as related with control (Chiroma *et al.*, 2006); (Biolders and Michels, 2002) which might have enriched maize yield and growth.

Biological yield (kg ha^{-1})

Data on maize biological yield as influenced by incorporation of green manures and varieties is presented in Fig. 7. Statistical analysis indicates the significant result of incorporation of green manures and varieties on biological yield of maize. The interaction of green manures incorporation and varieties was also found significant. Maximum biological yield of ($13149.3 \text{ kg ha}^{-1}$) was observed from the treatment of pigeon pea followed by biological yield of ($12897.5 \text{ kg ha}^{-1}$) from the treatment of sun hemp compared with minimum biological yield of ($8700.3 \text{ kg ha}^{-1}$) from the control. Maximum biological yield of ($12335.8 \text{ kg ha}^{-1}$) was observed from the variety Azam followed by biological yield of ($11744.6 \text{ kg ha}^{-1}$) from the variety Pihari compared with minimum biological yield of ($11659.6 \text{ kg ha}^{-1}$) from the variety Jalal. Improved rate of growth due to development of greater leaf area index the plots comprising of manure might be other cause of maximum biological yield (Carpenter and Board, 1997).

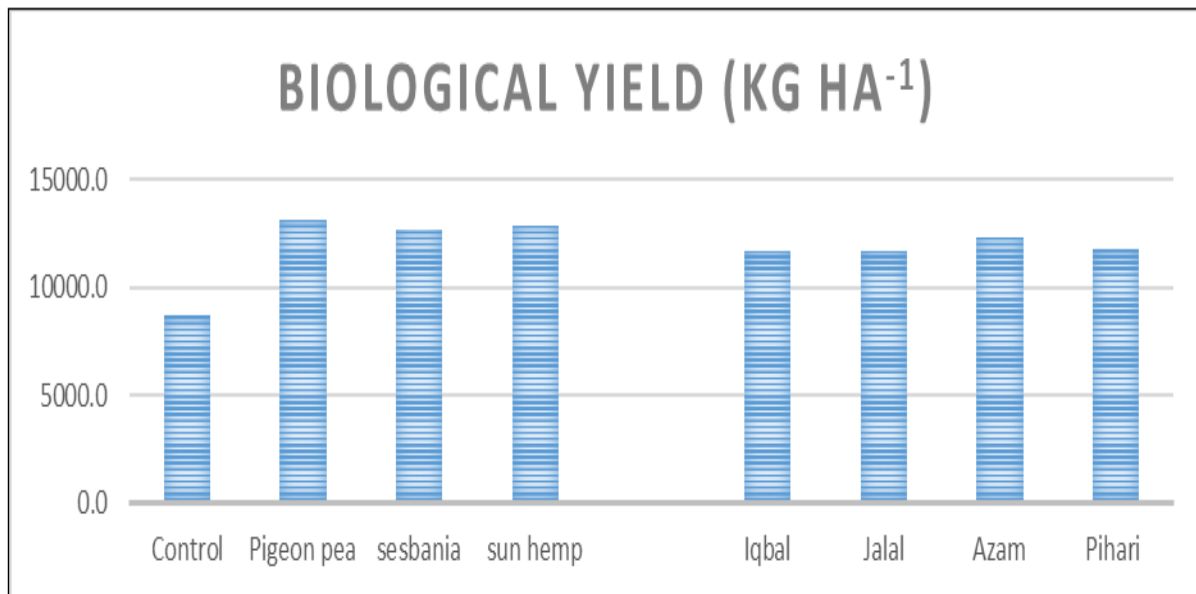


Fig. 7. Biological yield of maize as affected by green manures incorporation and varieites.

Conclusion

It was resulted from the field experiment that incorporation of green manures has improved the productivity compared with control. Higher grain yield, stover yield and biological yield and other yield contributing factors of maize was noted when plots are incorporated with pigeon pea. Maize variety Azam perform better for the above treatments and gives productivity well in the agro climatic conditions of Peshawar.

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