



International Journal of Agricultural and  
Environmental Research  
**FREE AND OPEN ACCESS**  
Available online at [www.ijaaer.com](http://www.ijaaer.com)  
ISSN 2414-8245 (Online)  
ISSN 2518-6116 (Print)



## INFLUENCE OF ORGANIC MANURE ON GROWTH AND YIELD OF LETTUCE CULTIVARS

IZHAR ULLAH<sup>1</sup>, JAVEED RAHMAN<sup>2</sup>, SAJID KHAN<sup>1</sup> IMRAN AHMAD<sup>1</sup>, NOOR UL AMIN<sup>1</sup>,  
MUHAMMAD SAJID<sup>1</sup>, NOOR HABIB<sup>2</sup>, MEHBOOB ALAM<sup>1</sup>,  
SHAH FAISAL<sup>1</sup>, FAZAL-E-AHAD<sup>3</sup>

<sup>1</sup>Department of Horticulture, University of Agriculture, Peshawar

<sup>2</sup>Department of Plant Breeding & Genetics, University of Agriculture, Peshawar

<sup>3</sup>Agriculture Research Institute Mingora Swat<sup>2</sup> Pakistan

Corresponding author email: [javedmiandam@gmail.com](mailto:javedmiandam@gmail.com)

### Abstract

An experiment with objective to check the influence of organic manure on growth and yield of lettuce cultivars was conducted at Ornamental Nursery, Horticulture section, The University of Agriculture Peshawar, Pakistan during 2014-15. Experiment was comprised of organic manure (farmyard manure and poultry manure) and lettuce cultivars (local and Chinese cultivar) carried out in randomized complete block design with factorial arrangement having three replications. Most of the study attributes of lettuce were significantly influenced by lettuce cultivars and organic manure alone or combination. Chinese cultivar produce maximum number of leaves plant<sup>-1</sup> (24.11), leaf area (124.79cm<sup>2</sup>), plant height (33.22cm) and total yield (2.36t.ha<sup>-1</sup>) as compare to local cultivar. Similarly maximum number of leaves plant<sup>-1</sup> (19.5), plant height (26.66cm), total chlorophyll content (0.0062mgcm<sup>-2</sup>) and total yield (4.16t.ha<sup>-1</sup>) was recorded in lettuce plant treated with poultry manure (10t.ha<sup>-1</sup>). The higher leaf area (145.6cm<sup>2</sup>), number of leaves plant<sup>-1</sup> (26), total chlorophyll (0.0272mgcm<sup>-2</sup>) and total yield (4.66t.ha<sup>-1</sup>) was obtained for Chinese cultivar under poultry manure application at rate of 10 t.ha<sup>-1</sup>. On the basis of above results, it is concluded that Chinese cultivar supplied with poultry manure give maximum growth and yield of lettuce in agro climatic conditions of Peshawar Valley.

**Key words:** Chemical fertilizer, Lettuce, Farmyard manure, Poultry manure,

### INTRODUCTION

Lettuce (*Lactuca sativa* L.) is an annual plant belongs to the family Compositeae one of the important vegetable in salad crop. It is the most well-liked salad crops in the world. It is a native of Europe, asia and northern Africa and has been cultivated for 5000 years. The term lettuce also is used to refer to the edible, succulent leaves of *L. sativa*, which commonly are eaten raw in salads, but also may be eaten cooked (Katz and Weaver, 2003). It is popular for its delicate, crispy, texture slightly bitter taste as fresh condition. Lettuce is 26th among 39 vegetables and of high nutrition value and is fourth of consumption. It is mainly a cold loving crop that grows well in day temperature of 18 to 25°C and the night temperature of 10 to 15°C (Prota, 2010). Lettuce is a rich source of antioxidants, Vitamin A and C and phytochemicals which are anti-carcinogenic. It also provides some dietary fibre, carbohydrates, protein and a small

amount of fat. Lettuce also provides calcium, iron and copper, with vitamins and minerals largely found in the leaf. Lettuce is usually consumed as a salad or shredded in a salad mix of onion, tomato, cheese and basil. It is usually used as salad with tomato, carrot, cucumber or other salad vegetable. It is often served alone or with dressing. Its nutritive value is not spoiled (Masarirambi et al., 2010). Organic manure can serve as alternative practice to inorganic fertilizers. Excessive application of chemical fertilizers may affect soil health and sustainable productivity (VirgineTenshia and Singram, 2005; Ali et al., 2011a 2011b; Arif et al., 2012 and Munsif et al., 2011; Ali et al., 2012). Vegetable are mostly cultivated through organic farming. People are preferring mostly organic farming as compared to inorganic farming as it enhances the quality of produce and are not hazardous for our health. At present, synthetic chemicals contribute a lot in fulfilling the nutrient requirement but their regular, excessive and

unbalanced use may lead to health, polluting our environment i.e. water, land and air resources, depletion of physico-chemical. Poultry manure has been recognized as most desirable of the natural fertilizer because of its high nitrogen content. It decomposes in the soil releasing nutrients for crop uptake. It provide the essential nutrients to the plants and also improve the soil structure and are considered as one of the most important part of sustainable agriculture because of having more phosphorus and nitrogen content that plays a vital building blocks for plant proteins and thus contributive to plant growth . Its application registered over 53% increases of N level in the soil, from 0.09% to 0.14% and exchangeable cations increase with manure application (Boateng et al., 2006). It can be a valuable resource for grass, small grain and other crop production. Hence application of organic manures like FYM and poultry manure to soil not only improve soil physical properties, pH, water holding capacity but also add important nutrients to the soil, thus increase the nutrient availability and absorption. Poultry manure had been reported to improve growth and yield of maize relative to no fertilizer (Adeniyi and Ojeniyi, 2005; Ezeibekwe et al., 2009) and improves the chemical and biological qualities of the soil which increases crop productivity relative to chemical fertilizers (Obi and Ebo, 1995). Keeping in view the importance of organic manure a study was planned to evaluate the influence of organic manures in enhancing the growth and yield of lettuce cultivars..

## MATERIALS AND METHODS

An experiment entitled “Influence of organic manure on growth and yield of lettuce cultivars” was conducted in Ornamental plants nursery (Horticulture Section), The University of Agriculture Peshawar, Pakistan on 22<sup>nd</sup> October 2014. The experiment was laid out in RCBD with factorial arrangement replicated three times, so the total numbers of treatment combination were 18. Two lettuce cultivars i.e one from Iceburg type (Lettuce leader) a local cultivar and other from loose leaf type (Chinese variety) seeds were sown for seedling 3-4 week prior to transplanting and were planted on ridge at a plant-plant distance of 1ft (30cm) and 1.5ft (45cm) row-row distance after attaining a reasonable size. The organic manure i.e poultry and farmyard manure at a rate of (10 and 20t.ha<sup>-1</sup>) were applied to planting ridges 2-3 weeks before transplantation and mixed with soil per treatments requirements. Hoeing, weeding, irrigation and other cultural practices were done on the basis of their needs.

**Data recording procedure:** Standard procedures were pursued to collect the data for growth and yield parameters. The attributes i.e plant height, number of leaves, total chlorophyll content, leaf area and total yield were studied during the course of experimentation. Three plants from each plot were selected randomly and their heights from base to terminal portion of plant were measured with the help of measuring tape and their average was calculated. Number of leaves were counted in three randomly selected plants and then averaged for single plant was worked out. Leaf area was calculated through leaf area meter and total chlorophyll content was measured with Spad (Richardson et al., 2002).

**Statistical analysis:** The data recorded were subjected to analysis of variance (ANOVA) technique appropriate for RCBD design with factorial arrangement. Means were compared by using Least Significance Differences 5% (LSD) test when F values were significant. Statistical software Statistix (8.1) were used for calculating ANOVA and LSD value (Steel and Torie, 1997)

## RESULTS AND DISCUSSION

**Number of leaves plant<sup>-1</sup>:** Results showed that organic manure and lettuce cultivars alone or in combination significantly ( $P \leq 0.05$ ) increased number of leaves plant<sup>-1</sup> compared with the control treatment (table1, figure 1). The higher number of leaves plant<sup>-1</sup> (24.11) was obtained in lettuce cultivar as compare to local cultivar (11.22). Similarly maximum number of leaves plant<sup>-1</sup> (19.5) was recorded from the treatment receiving poultry manure at rate of 10t.ha<sup>-1</sup> as compared to control (15.5) .Maximum number of leaves plant<sup>-1</sup> (26) were produced by chinese cultivar that received poultry manure as compare to local cultivar grown in untreated which plot produce minimum number of leaves (10.33) plant<sup>-1</sup>. The increase in number of leaves plant<sup>-1</sup> in poultry manure applied plant might be due to readily availability of nutrients and favorable conditions during the growth period of the crop. An increase in number of leaves plant<sup>-1</sup> with fertilizer application has also been reported by Ragheb et al. (1987). Similarly higher number of leaves plant<sup>-1</sup> was also obtained with poultry manure followed by cattle manure (Michael et al., 2012).The increase in vegetative growth of tomato plant application of chicken manure may be due to to its role in enhancing soil physical condition and availability of more nutrients. This result is in harmony with Togun and Akanbi (2003), Adenawoola and Adejoro (2005), Ewulo et al.

(2008) and Ayeni et al. (2010). It is also similar to the findings of (Fagmi and Odebode, 2007) who reported that increased number of leaves of pepper resulting from application of high rate of chicken manure.

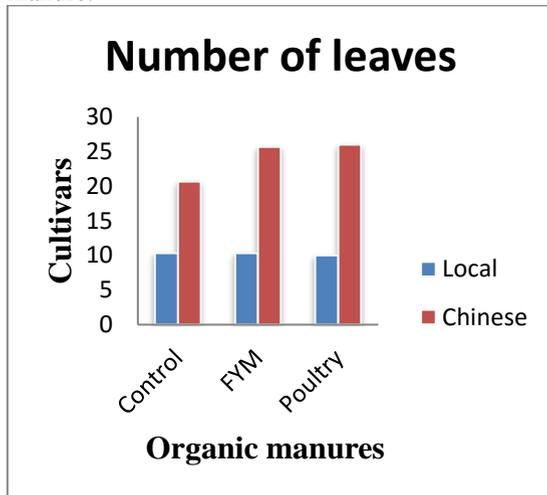


Fig-1. Number of leaves plant<sup>-1</sup> as influenced by combine effect of lettuce cultivars and organic manure

**Leaf area (cm<sup>2</sup>):** Results showed that leaf area was significantly ( $P \leq 0.05$ ) influenced by lettuce cultivars alone or in combination of organic manure and lettuce cultivar (table 1, fig 2). A highest leaf area (124.79cm<sup>2</sup>) was recorded in chinese cultivar as compared to local cultivar (55.84cm<sup>2</sup>). Maximum leaf area (145.16cm<sup>2</sup>) was recorded in chinese cultivar under the application of poultry manure and local cultivar supplied with poultry manure gives minimum leaf area (48.01cm<sup>2</sup>). Maximum leaf area plant<sup>-1</sup> might be due to soil organic matter which increase soil fertility that retain cations and conserve nutrient in organic form and release nutrient slowly for plant uptake and growth. It also provide food for microorganism living in the soil as result leaf vigor increases (FAO, 2002). Similarly maximum leaf area was obtained in lettuce provided with poultry manure as compare to chemical fertilizer (Michael et al., 2012). Poultry manure increased leaf area more than the other application rates possibly because an increase in poultry manure was appropriate for increasing carbon content, water holding capacity, aggregation of soil and decrease of bulk density, all of which interplay to increase leaf area and total chlorophyll content of wild okra. This is consistent with the findings of (Amujoyegle et al., 2007; Sharpley and Smith, 1991; Egerszegi, 1990) who reported that increasing the application rate of poultry manure enhanced leaf area, total chlorophyll content, carbon content, water holding capacity, and

decrease bulk density of soil which culminate and interplay to promote crop yield.

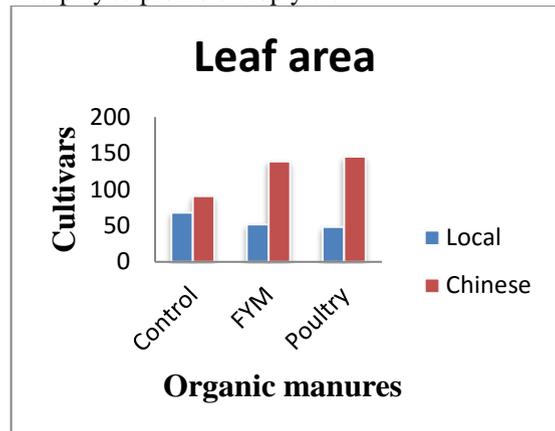


Fig-2. Plant leaf area as influenced by combine effect of lettuce cultivars and organic manure

**Plant Height (cm):** Data presented in Table 1 indicated that lettuce cultivars alone and their interaction of organic manure and lettuce cultivars (fig-3) significantly ( $P \leq 0.05$ ) influenced plant height. Chinese cultivar gain maximum height (33.22cm) as compared to local cultivar (14.77cm). Similarly Chinese cultivar treated with poultry manure produce taller plant (36.66cm) as compared to local cultivar in control plot that produce shorter plant (13.33cm). The poultry manure fertilized plants were the tallest as compare to cattle and inorganic manure. (Michael et al., 2012) also reported that poultry manure treated plant gained maximum plant height as compared to inorganic fertilizer. This is in accordance with the findings and reports of many researchers (Lombin, 1992; Izunobi, 2002, Fabiya and Ogunfowora, 1992). It is also similar to the findings of (Fagimi and Odebode, 2007) who reported increased plant height of pepper resulting from application of high rate of chicken manure.

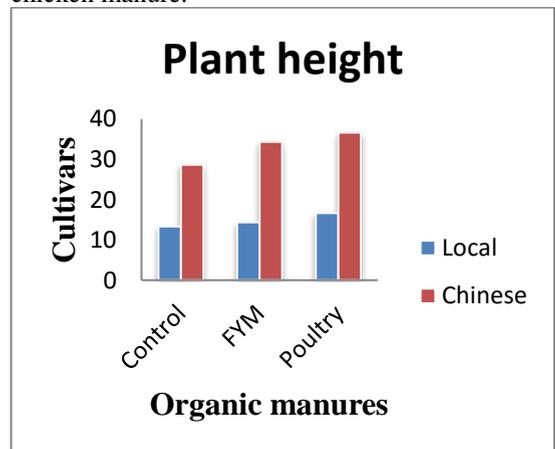


Fig-3. Plant height as influenced by combine effect of lettuce cultivars and organic manure

**Total chlorophyll (mgcm<sup>-2</sup>):** The total chlorophyll content was significantly influenced by poultry manure and interaction of organic manure and lettuce cultivars (table 4, fig 4). Poultry manure treated plant had highest total chlorophyll content (0.0268mgcm<sup>-2</sup>) as compare to other treatment. The statistical analysis of data revealed that higher chlorophyll content was recorded in Chinese cultivar treated with poultry manure; whereas lowest chlorophyll content was noted in local cultivar in control plot. Ewulo et al. (2008) reported that N, P and K content were improved with the increase in the level of poultry manure up to 30t.ha<sup>-1</sup>. An encouragement result of organic and inorganic fertilizers on chlorophyll contents might be recognized that N is a constituent of chlorophyll molecule. Moreover, nitrogen is the main constituent of all amino acids in proteins and lipids that acting as a structural compounds of the chloroplast (Badr and Fekry, 1998; Arisha and Bradisi, 1999).

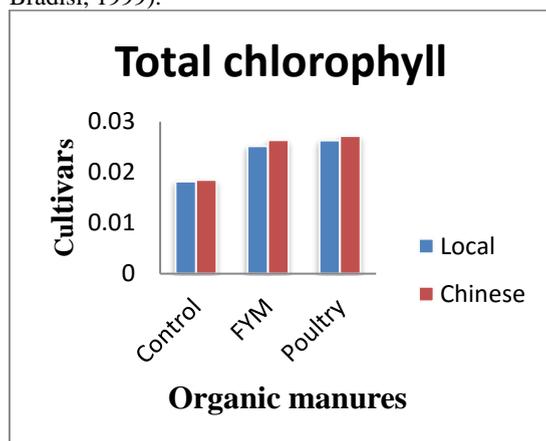


Fig-4. Total chlorophyll as influenced by combine effect of lettuce cultivars and organic manure

**Total yield (t.hac<sup>-1</sup>):** Mean data regarding total yield is presented in table 1 and their interaction in fig 5.

Plant supplied with poultry manure produce maximum total yield (4.16t.ha<sup>-1</sup>) as compare to untreated plant (0.63t.ha<sup>-1</sup>). Higher total yield (4.66t.ha<sup>-1</sup>) was noted in chinese cultivar with poultry manure application and chinese cultivar in untreated plot produce lower total yield (0.08 t.ha<sup>-1</sup>). Rao (1991) reported that soil could be enriched with the decomposition of organic materials into large amount of nitrogen in soil before transplanting that increase total yield. Similarly Xu et al. (2002) study specified that vegetable grown with higher level of organic manure give higher total yield as compare to low level of organic manure. Plant fertilized with poultry manure had the highest growth parameter and marketable yield. Similar results have been reported by (Uddin et al., 2009). This could be attributed to the nutrient content of the fertilizer used. Cantaloupe (*Cucumis melo*) plants treated with chicken manure display comparatively higher profitable yield than those getting no chicken manure (Ghanbarian et al., 2008). Similar results were gained with broccoli (Ouda and Mahadeen, 2008) and also cattle manure was found to increase pod yield of okra (Ogunlela et al., 2005). It could be accredited due to the large amount of accessible phosphorus and available potassium contained in the chicken manure.

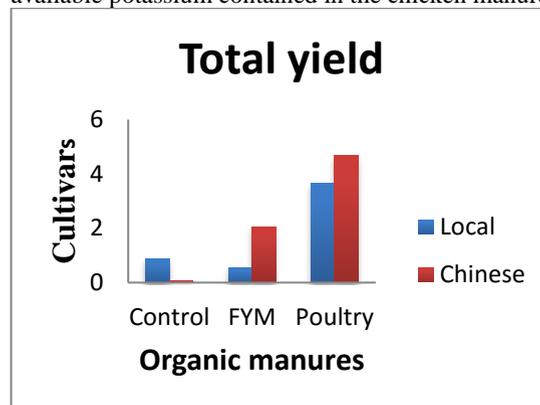


Fig-5. Total yield as influenced by combine effect of lettuce cultivars and organic manure

**Table 1. Number of leaves plant-1, leaf area, plant height, total chlorophyll and total yield of lettuce cultivars as influenced by organic manures.**

Lettuce cultivars	Number of leaves plant <sup>-1</sup>	Leaf area (cm <sup>2</sup> )	Plant height (cm)	Total Chlorophyll content	Total yield (t ha <sup>-1</sup> )
Local	11.22b	55.84b	14.77b	0.0233	1.70
Chinese	24.11a	124.79a	33.22a	0.0240	2.36
<b>LSD 0.05</b>	3.19	21.18	7.00	NS	NS
<b>Organic Manure</b>	15.5b	79.33	21	0.0184b	0.63b
Control	18ab	19.5a	95.02	0.0258a	1.30b
Poultry	19.5a	96.58	26.66	0.0268a	4.16a
<b>LSD 0.05</b>	3.90	NS	NS	0.0062	1.57
<b>Interaction</b>					
C x M	Fig.1	Fig.2	Fig.3	Fig.4	Fig.5

Means followed by different letters are significantly different at  $p \leq 0.05$

## CONCLUSION

It was concluded from the study that higher number of leaves plant<sup>-1</sup>, leaf area, plant height, total chlorophyll content and total yield was evidenced in Chinese cultivar supplied with poultry manure at a rate of 10t.ha<sup>-1</sup>. The application of poultry manure at a rate of 10t.ha<sup>-1</sup> is recommended for achieving better growth and yield of Chinese cultivar in agro climatic conditions of Peshawar Valley,

## ACKNOWLEDGEMENT

I am thankful to Mr. Noor Habib as editor author of the paper who worked a lot for proof reading of the manuscript.

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