

EFFECTS OF PHOSPHORUS APPLICATION ON PLANT POPULATION, NUMBER OF LEAVES AND YIELD OF GREEN FODDER MAIZE IN D. I. KHAN, PAKISTAN

M. Niamatullah, M. Sadiq, C. S Hayat* H. Farid and M. Mumtaz

Faculty of Agriculture, Gomal University, D. I. Khan, Pakistan, *Faculty of Veterinary Sciences, Bahaudin Zakaria University, Multan, Pakistan

Corresponding author email: niamatullahbar@gmail.com

ABSTRACT

An experimental study was conducted to determine the effects of phosphorus applied by various methods in splits on plant population, number of leaves and yield of green fodder maize at the Post Graduate Agricultural Research Farm, Gomal University, D. I. Khan during the kharif season of 2009. The field experiment was conducted in a Randomized Complete Block Design with three blocks. The plot size was kept 3.6 m x 5.0 m. The nitrogen fertilizer was applied in the form of urea in three splits. First split at the time of sowing, second with first irrigation and third with second irrigation. The phosphorus was applied @ 50Kg ha⁻¹. The results revealed that all the treatments under study were significantly influenced all the parameters. The treatment T₅ having 2/3 phosphorus at side dressed with first irrigation was proved the best combination in view of maximum plant population, maximum number of leaves and maximum yield of green fodder maize (45.13 t ha⁻¹).

Key words: Phosphorus, parameters, treatments, sowing, split, irrigation.

INTRODUCTION

Maize (*Zea mays* L.) is a kharif season dual purpose crop. It can be grown successfully in temperate, tropical and sub-tropical regions under irrigated and barani conditions. It can be grown in spring and autumn seasons. To overcome both the deficit in nutrient supply and the adverse effects of chemical fertilizer, it is suggested that the use of organic fertilizers will assist proper use of livestock waste as well as increase soil fertility and release nutrients to fodder for sustainable production in an eco-friendly, pollution-free environment. Fodder is the basic need for livestock production. Supply of regular, adequate and nutritious fodder is essential for livestock production in order to meet the demand of milk, butter and other by-products for human consumption. Its fodder contains 1.56% protein, 0.30% fat and 5.27% fibre (Nazir *et al.*, 1996). Green maize forage is rich in vitamin A because the green maize leaves and stalks contain greater total amount of carotene than the grain. Although maize fodder has low protein content but it is realized by the animals due to being succulent and palatable (Ali *et al.*, 2004). There are different varieties with wide range of adaptability which respond differently to fertilizer application under changing soil and environmental conditions. Although the soil and climatic conditions of Pakistan are favourable for maize production but its per hectare fodder yield is very low (1600 kg ha⁻¹) as compared to other growing countries of the World, like Italy (9530 kg ha⁻¹) and Argentina (5560 kg ha⁻¹) (Anonymous, 2003; Gurmani *et al.*, 2008). This yield

level is hardly 25 to 30% of the achievable potentials (6000 kg ha⁻¹). Low yield of maize is due to many constraints but fertilizer application is one of the major factors, which can increase fodder production per unit area, which are in agreement of Mohammad *et al.* (1995). Among other major elements Phosphorus is an essential nutrient for plant growth and development. It plays fundamental role in metabolism and energy producing relations in plants. It is an integral part of nucleic acids and is essential for cellular respiration and in the metabolism of the starch, protein and fats. Phosphorus applications stimulate blooming and seed formation of maize. Judicious use of phosphorus will help in increasing per hectare yield (Demkin and Ageev, 1990). Therefore, it is imperative to study the effects of phosphorus on maize fodder yield.

MATERIALS AND METHODS

A field experiment was carried out at the Post Graduate Research Farm, Gomal University, D.I. Khan to evaluate the impact of phosphorus application on yield of fodder maize (*Zea mays* L.). The experiment was laid out in a randomized complete block design with three repeats and net plot size of 3.6 m x 5.0 m. Observations on yield parameters of maize fodder were recorded by using standard procedures. The experiment was comprised of eight treatments which were as follows;

T₁= control

T₂ = Full dose of P₂O₅ at sowing time (Broadcast)

T₃ = ½ P₂O₅ at sowing + ½ with 1st irrigation (Broadcast)

T₄= 2/3 at sowing and 1/3 at knee plant height

T₅ = 2/3 at sowing + 1/3 as side dressed with 1st irrigation
 T₆ = 1/2 at sowing + 1/2 as side dressed with 1st irrigation
 T₇ = 1/3 at sowing + 1/3 with 1st irrigation + 1/3 with 2nd irrigation

T₈ = All the P side dressed at sowing.

The crop was sown manually by using single row hand drill having 30 cm distance on 08-04-2009 @ 75 kg ha⁻¹ seed. The nitrogen (N) fertilizer was applied in the form of Urea in three splits. First split at the time of sowing, 2nd with first irrigation and 3rd with second irrigation. All other agronomic practices except those under study were kept normal and uniform for all the treatment combinations.

Following observations were recorded during the course of study as;

Number of plants m⁻² at harvest, which was recorded by counting all the plants in one square meter at three randomly selected from three different places in each plot and then the average was calculated; number of leaves plant⁻¹, where leaves of ten randomly selected plants were counted from each plot and their average was calculated; green fodder yield (t ha⁻¹), where all the plots of each replication were harvested and weighted separately to get fodder yield in kg per plot and then converted into tons ha⁻¹.

RESULTS AND DISCUSSION

Effect of phosphorus application yield of fodder maize was investigated and the results are presented in this section.

Number of Plant m⁻²: The number of plants m⁻² at harvest is the most important factor. The data regarding number of plants per square meter is presented in Table 1. The information contained in Table 1 revealed the significant influenced of number of plants per square meter on yield of fodder maize. Maximum number of plants per square meter was found in T₅ (40.67) followed by T₄ (38.67). The minimum number of plants per square meter was observed in T₁ (34.67) and this was statistically similar to the treatments T₃ (36.33), T₄ (38.67) and T₇ (36.33), the results are in close association with Mohammad *et al.*, 1995 and Ali *et al.*, (2004).

Number of leaves plant⁻¹: The number of leaves per plant contributes much to the green fodder yield. The data representing green fodder yield is given in Table 1. The data indicate that the results were highly significant. Maximum number of leaves per plant (12.9) was present in T₅ (2/3 as side dressed at sowing +1/3 as side dressed at sowing + 1/3 at knee height) (12.23). All other treatments including T₁ (control) were at par with each other and statistically showed no differences in number of leaves per plant. However, minimum number of leaves per plant (9.80) was present in treatment T₁. These results

are supported by Chaudhary and Hussain, 1985; Bhatti *et al.*, 1992.

Table 1: Effect of time and method of phosphorus application on different yield parametric.

Treatments	No. of plants m ⁻²	No. of leaves plant ⁻¹	Green fodder yield t paac ⁻¹
T ₁	34.67 ^d	9.833 ^b	38.78 ^d
T ₂	37.00 ^{bc}	10.37 ^b	40.19 ^{cd}
T ₃	36.33 ^{cd}	10.37 ^b	41.19 ^c
T ₄	38.67 ^{ab}	12.23 ^a	43.60 ^{ab}
T ₅	40.67 ^a	12.97 ^a	45.13 ^b
T ₆	36.00 ^{cd}	10.60 ^b	42.48 ^{bc}
T ₇	36.00 ^{cd}	10.57 ^b	41.21 ^c
T ₈	37.33 ^{bc}	10.90 ^b	41.98 ^{bc}

LSD value (5%)

F value = 7.4342^{*}

The means sharing same letters in a column did not differ significantly (P<0.05)

Green fodder yield (t ha⁻¹): The green fodder yield is the aggregate of all the major yield components. The data regarding green fodder yield is given in Table 1. The data provided that treatments have shown highly significant results. Maximum green yield (45.13 t ha⁻¹) was found in T₅ followed by T₄ (43.60 t ha⁻¹), which were statistically similar to the treatments T₆ and T₈ and these treatments were at par with each other and showed no significant differences in green fodder yield. Furthermore, these were statistically similar to the treatments T₂, T₆, and T₈ mentioned above. The minimum green fodder yield was observed in T₁ (38.78 t ha⁻¹) which was similar to the treatment T₅ was probably due to its increased efficacy in almost all the major yield components. The results are in agreement with previous studies conducted by Gurmani *et al.*, (2006); Hussain and Khan, (2003); Imran *et al.*, (2007).

Conclusion: The study arrived at conclusion that treatment T₅ in terms of maximum plant population, maximum number of leaves and also proved the best combination especially in case of green fodder yielding 45.13 t ha⁻¹ markedly enhanced yield attributes of fodder maize in D. I. Khan, Pakistan.

REFERENCES

- Ali, Z., M. Z. Hassan, S. Khan and M. Bashir (2004). Cost benefit analysis of wheat, barley, oat and mustard crops for fodder production. Sarhad J. Agric., 20(4): 669-671.
- Anonymous (2003). Agriculture Statistics of Pakistan. Ministry of Food and Agricultural Division

- (Planning unit), Government of Pakistan, Islamabad.
- Bhatti, M. B., A. Hussain and D. Mohammad (1992). Fodder production potential of different oat cultivars under two cut systems. *Pakistan J. Agric. Res.*, 13: 184-190.
- Chaudhary, M. H. and A. Hussain (1985). A new high fodder yielding variety (P 518) of cowpea. *Pakistan J. Agric. Res.*, 6: 267-270
- Demkin, V. I. and V. V. Ageev (1990). Productivity of maize as dependent on weather conditions and fertilizers and methods of covering them in a zone of unstable moisture supply. *Agrokhimiya*. 7: 73-82.
- Gurmani, Z. A., M. S. Zahid, M. Imran and A. Saleem (2008). Performance of maize cultivars for fodder production under rainfed conditions of Pothwar Tract. *Pakistan J. Sci. Ind. Res.* 51(2): 103-106.
- Gurmani, A. Z., S. Shafiq, M. S. Zahid, A. Hussain, M. Imran and S. Khan (2006). Effect of phosphorus fertilizer application on green fodder and grain yield of four vetch species. *PJST*. 1(8 & 9): 1-8.
- Hussain, A. and S. Khan (2003). Fodder yield and quality of summer cereal fodder crops/hybrid under various regimes of harvesting. *Int. J. Scie. Tech. and Dev.*, 22: 41-45.
- Imran, M., A. Bakhsh, S. Khan, A. Hussain, Z. A. Gurmani and M. Qasim (2007). Forage yield and quality potential of dual-type pearl millet varieties under rainfed conditions of NARC. *Pak. J. Agric. Res.*, 20(3-4):137-141.
- Khan, M. A. (1986). Effect of nitrogen levels on the yield and quality of maize and cowpeas fodders in monoculture and mixture. M.Sc (Hons) thesis, Department of Agronomy. Uni. Agri.Faisalabad.
- Mohammad, D., A. Hussain, S. Khan, S. Riaz and M. B. Bhatti (1995). Fodder yield and quality potential of forage maize cultivars under rainfed conditions. *Sarhad J.Agric.*, 11: 285-289.
- Nazir, S., E. Bashir and R. Bantal. (1996). *Crop production*, 2nd Edition, National Book Foundation, Islamabad.
- Patel, M. S. and R. G. Patil (1990). Effect of different levels of phosphorus and zinc and nutrient uptake of groundnut and maize fodder. *Gujrat. Agri. Uni. Res. J.*, 16(1): 63-66.