Biotica Research Today Vol 4:4 2022

252/254

Impact of Multi-Nutrient Briquettes on Movement of Nitrogen and Phosphorus in Soil

Sunil B.H.[1*], Lal Chand Malav[2], Brijesh Yadav[2] and Immanuel C. Haokip[3]

[1]ICAR-National Bureau of Soil Survey and Land Use Planning, Nagpur, Maharashtra (440 033), India
[2]ICAR-National Bureau of Soil Survey and Land Use Planning, RC, Udaipur, Rajasthan (313 001), India
[3]ICAR-Indian Institute of Soil Science, Bhopal, Madhya Pradesh (462 038), India

Open Access

Corresponding Author

Sunil B.H.
e-mail: sunilbh62@gmail.com

Keywords

Briquettes, Fertilizers, Nitrogen, Phosphorus

Article History

Received on: 04th April 2022
Revised on: 16th April 2022
Accepted on: 17th April 2022

E-mail: bioticapublications@gmail.com

How to cite this article?

Sunil *et al.*, 2022. Impact of Multi-Nutrient Briquettes on Movement of Nitrogen and Phosphorus in Soil. Biotica Research Today 4(4): 252-254.

Abstract

Application of chemical fertilizers leads to the loss of soil fertility due to the imbalanced use of fertilizers which have adversely affected agricultural productivity and caused soil degradation. For sustainable agriculture scientific and efficient use of fertilizers is important. A number of investigators have shown that there is a definite and nearly constant requirement of nitrogen and phosphorus for the production of high yielding varieties of the crop. The movement of nutrient N was maximum in treatment receiving recommended dose of fertilizer through fertigation at all depths followed by the application of briquette in root rhizosphere. The movement of nutrient P was observed at a lower magnitude; however, the P movement was maximum in soluble fertilizers and briquettes.

Introduction

Application of chemical fertilizers leads to the loss of soil fertility due to the imbalanced use of fertilizers which have adversely affected agricultural productivity and caused soil degradation. For sustainable agriculture scientific and efficient use of fertilizers is important. A number of investigators have shown that there is a definite and nearly constant requirement of nitrogen and phosphorus for the production of high yielding varieties of the crop. Nitrogen (N) is the most important and key nutrient for production, as regarded all over the world for its huge requirements and instability in the soil. So, in order to reduce the nitrogen loss, deep placement of all essential fertilizers, may be more efficient and farmers can be more benefited from this compared to the broadcast method. In Bt-cotton cultivation, farmers from Marathwada region usually, use non-urea fertilizer as basal during final land preparation. An effective alternative may be the use of Urea Super Granule (USG) or NPK briquette for higher yield and efficient use of nitrogen in Bt-cotton cultivation. Briquettes are entirely mineral in their formulation and are manufactured by a fertilizer briquettes machine. The briquettes are a unique fertilizer concept apart from the conventional fertilizers in which the fertilizer is manufactured into a briquette approximately as the size of the end of one`s finger (about 2.75 gms) as opposed to the more common granular prill sized fertilizers or liquid fertilizers. The land application of briquette is also unique in that it is banded below the soil surface between planted rows. The theory behind the briquette is that a smaller surface area to volume ratio has been shown to significantly reduce nitrogen loss through ammonia volatilisation (Mendhe *et al.*, 2006). Surface applied urea is reported to reach nitrogen loss as high as 35% however; buried briquettes only lose approximately 4% of its nitrogen, which is a considerable improvement in nitrogen use efficiency (Rahman *et al*., 2016). The low use efficiency of N and P is because of various reasons such as volatilisation, denitrification, surface runoff, leaching losses for nitrogen and fixation of phosphorus in soil. Deep placement of fertilizers such as, Urea Super Granules (USG) and NPKbriquette into the anaerobic soil zone is an effective method to reduce volatilisation loss (Mikkelsen *et al*., 1978). Deep placement of urea super granule (USG) at 8-10 cm soil depth can save 30% N compared to Prilled Urea (PU), increases absorption rate, improves soil health and ultimately increases rice yield (Naznin *et al*., 2013). Moreover, deep placement method of fertilizer application is environment friendly and will not decrease the normal fertility of land (Afroz and Islam, 2014).

Materials and Methods

The experiment was laid out in a randomised block design with three replications and 5 treatments. A plot size of 7.2×5.4 m^2 with inter and intra row spacing of 180 cm and 30 cm respectively used and the soil samples collected at 15(H)-15(V) cm, 15(H)-30(V) cm, 30(H)-15(V) cm and 30(H)-30(V) cm depth *i.e*., H - Horizontal distance, V - Vertical distance. The initial soil sample was taken before planting. The pH was found neutral to alkaline (7.73) by using potentiometer method of 1:2 soil-water suspension on digital pH meter, low organic carbon content (3.30 g kg^{-1}) was analysed by using Walkley and Black Method (Wet Oxidation Method) and available nutrient like low nitrogen (140.0 kg ha^{-1}) was measured by alkaline potassium permanganate method, whereas, low available phosphorus (8.50 kg ha^{-1}) was measured by using 0.5 M sodium bicarbonate as an extractant and absorbance was read in the spectrophotometer.

Treatments details are as follows.

T_1: Absolute Control (No fertilizer application).

T_2: Soil application of 120:60:60 by N, P_2O_5, K_2O kg ha^{-1} and drip irrigation.

T_3: RDF through fertigation (soluble fertilizer: 80:40:40 NPK kg ha^{-1}).

T_4: 120:60:60 NPK kg ha^{-1} through briquettes with drip irrigation.

T_5: Application of NPK + micronutrient briquettes (120:60:60 NPK kg ha^{-1} + 20 kg ha^{-1}) $ZnSO_4$.

Movement of Available Nitrogen

Results of the investigation showed that available N content of the soil was influenced by the application of recommended dose of fertilizer through a fertigation at various growth stages of crop *i.e*., 30, 60, and at last picking stage in the soil of Marathwada region. The highest available nitrogen at different depth was observed in treatment receiving RDF through fertigation likewise (193.64 kg ha^{-1}) at 15-15 cm depth, (208.61 kg ha^{-1}) at 15-30 cm depth, (193.64 kg ha^{-1}) at 30-15 cm depth and at 30-30 cm depth available nitrogen was 170.91 kg ha^{-1} and also lowest available nitrogen was observed in treatment without fertilizer *i.e*., 159.15 kg ha^{-1} at 15-15 cm depth, 165.06 kg ha^{-1} at 15-30 cm depth. At 30-15 cm depth, it was 166.99 kg ha^{-1} and 165.23 kg ha^{-1} at 30-30 cm depth. At 60 DAS (flowering stage), available nitrogen status of soil ranged from 165.23-170.91 kg ha^{-1} at 15-15 cm depth, at 15-30 cm depth values were 161.5-181.8 kg ha^{-1}, at 30-15 cm depth available nitrogen status of soil ranged from 154.89-187.42 kg ha^{-1}, at 30-30 cm depth available nitrogen status of soil ranged from 182.20-189.01 kg ha^{-1}. The available nitrogen content was significantly higher under N applied through fertigation and briquette as compared with soil application. In respect with the nitrogen movement from the surface to 15 cm and 30 cm depth, it was noticed that more nitrogen was retained by treatment fertigation at all depths.

Movement of Available Phosphorus

The effects of briquettes on the movement of available phosphorus at different horizontal and vertical distances from the point of placement of NPK-Zn fertilizer briquettes. At 30 DAS (square formation stage) the highest available phosphorus at different depth was observed in RDF through fertigation (9.39 kg ha^{-1}) at 15-15 cm depth, (9.73 kg ha^{-1}) at 15-30 cm depth (9.50 kg ha^{-1}) at 30-15 cm depth and (10.20 kg ha^{-1}) at 30-30 cm depth. While lowest available phosphorus was observed in the treatment without fertilizer about (7.53 kg ha^{-1}) at 15-15 cm depth, (6.95 kg ha^{-1}) at 15-30 cm depth, at 30-15 cm depth (7.99 kg ha^{-1}) and (7.41 kg ha^{-1}) at 30-30 cm depth. The application of briquette was performed intermediate between fertigation and recommended a dose of fertilizer through conventional method. At 60 DAS and at last picking available phosphorus status of soil in T_3 was superior among other treatment followed by NPK and NPK+Zn briquette. The movement of nutrient phosphorus was observed at a lower magnitude. However, the phosphorus received in the form of soluble fertilizers and briquette showed a higher rate of phosphorus movement which might be continuum because of continuous release of phosphorus from soluble fertilizer and briquettes.

Conclusion

It may be concluded that maximum nitrogen was retained by the treatment of fertigation at all depths followed by application of briquette in root rhizosphere. The movement of nutrient phosphorus was observed at a lower magnitude. It did not vary significantly; however, the phosphorus movement was maximum in soluble fertilizers and briquettes.

References

Afroz, H., Islam, M.R., 2014. Floodwater nitrogen, rice yield and N use efficiency as influenced by deep placement of nitrogenous fertilizers. *Journal of Environmental Science and Natural Resources* 7(1), 207-213.

Mikkelsen, D.S., De Datta, S.K., Obcemea, W.N., 1978. Ammonia volatilization losses from flooded rice soils. *Soil Science Society of America Journal* 42(5), 725-730.

Mendhe, J.T., Mankar, P.S., Khawale, V.S., Jarande, N.N., Kanase, A.A., 2006. Effect of briquette, inorganic fertilizers and organic manure fertilization on the growth and yield of paddy (*Oryza sativa* L.) var. PKV-Makrand. *Journal of Soils and Crops* 16(1), 232-235.

Naznin, A., Afroz, H., Hoque, T.S., Mian, M.H., 2013. Effects of PU, USG and NPK briquette on nitrogen use efficiency and yield of BR22 rice under reduced water condition. *Journal of the Bangladesh Agricultural University* 11(2), 215-220.

Rahman, M.M., Samanta, S.C., Rashid, M.H., Abuyusuf, M., Hassan, M.Z., Sukhi, K.F.N., 2016. Urea super granule and NPK briquette on growth and yield of different varieties of aus rice in tidal ecosystem. *Asian Journal of Crop Science* 8(1), 1-2.