Assessment of Nutriseed Pack Technology on Maize in Cuddalore District

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Abstract— *On Farm Trail was conducted in five locations of Mangalore and Nallore Block of Cuddalore District to assess the 'Nutriseed pack' technique on maize. Nutriseed pack is a small tubular form that is 20 mm diameter, 10 cm height. Nutriseed pack contains seed at top, manure in the middle and fertilizer at bottom. The experiment consisted of three treatments viz., Farmer practice (TO1), recommended dose of fertilizer (TO2) and Nutriseed Pack (TO3) The results revealed that, the grain yield recorded with different treatment ranged between 65.44 to 74.00 q ha^{-1}. Among the technologies, Nutriseed pack (TO3) was recorded more yield of 74.00 q ha^{-1} (13.08% increased yield over control) than that of 71.92 q ha^{-1} recommended dose of fertilizer applied in the field followed by farmers practice (65.44 q ha^{-1}). Similar trend of results were also observed in yield parameters. Enrichment of manure pellet and fertilizer that is Nutriseed pack was effective when compared to other technologies.*

Keywords— Nutriseed Pack, Hybrid Maize, Yield, Yield Attributes.

I. INTRODUCTION

After rice and wheat, maize is the third most important field crop in India. It accounts for ~9 per cent of total food grain production in the country. Maize has three growing seasons in India, *viz., Kharif, Rabi and Spring*. Fertilizers play an important role in increasing the maize yield to the tune of 40-45 per cent over unfertilized crop. Normally fertilizers are broadcasted. Many times, straight fertilizers are used as the source of nutrients. Application of straight fertilizer leads to loss of nutrient through leaching and volatilization. In order to manage these losses split application is recommended for soluble fertilizers especially for urea and muriate of potash. Now a days, newly emerging technology namely "Nutriseed Pack Technique" is developed in the Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University (TNAU), Coimbatore. This technology reduces the nutrient losses in the soil. Hence, Nutriseed pack technique helps in improving the nutrient use efficiency and yield. The present study was carried out to assess Nutriseed pack technology on maize in Cuddalore District.

II. MATERIALS AND METHODS

The experiment was conducted in the farmer's field of Nallur and Mangalore Block of Cuddalore District, Tamil Nadu, India. The texture of the experimental soil was sandy loam and pH 8.15. The nutrient status of the experimental soil was low organic carbon (0.47 %), low in available nitrogen, medium in available phosphorus and high in available potassium. The hybrid maize COH(M) 6 was grown as test crop. The technologies *viz.*, TO1 - Farmers practice, TO2 - Recommended doses of fertilizers (250:75:75 kg N, P_2O_5 and K_2O ha^{-1}) and TO3- Nutriseed pack technology were taken for this study.

Nutriseed pack is a small tubular assembly (20 mm diameter, 10 cm height), which contains seed at top, manure in the middle and fertilizer at bottom. For maize crop, 100 % recommended dose of NPK fertilizers was calculated and mixed up thoroughly and fertilizer pellet was prepared by using the fertilizer pellet making machine. Then each fertilizer pellet was encapsulated in polyester coated paper pouch having micropores and sealed by sealing machine. Manure pellet was prepared by enriching vermicompost with micronutrients. During enrichment, 60% of moisture was maintained. To achieve complete enrichment frequent mixing of manure was done. After 10 days of incubation, the enriched manure was pelletized by using manure pellet making machine. Nutriseed pack was composed by placing encapsulated fertilizer pellet at bottom, manure pellet in the middle and seed (hybrid maize COH(M) 6 with bioinoculant mixture (*Azosprillum*, phosphobacteria and

Trichoderma) on the top and then wrapping them together by newspaper as a tubular roll. Instead of sowing seeds, 'Nutriseed packs' were placed in soil at 5 cm depth.

The 'Nutriseed packs' was placed on the sides of the ridges horizontally at a spacing of 60 × 30 cm so as to accommodate the recommended plant population. For surface application, 100% P and K were applied basally and 50% N was applied at basal. The remaining 50% of N was applied as 25% at 25th day after sowing and 25% on 45th day after sowing. First irrigation was given immediately after sowing. Subsequent irrigations were scheduled once in three days. Growth parameters and dry matter production were observed at growth stages. Yield and yield attributes were recorded.

III. RESULT AND DISCUSSION

3.1 Plant height

The plant height was recorded at vegetative stage, tasseling stage, milking stage and harvest stage. Plant height ranged between 48.6 to 75.1 cm at vegetative stage, 119.4 to 151.9 cm at tasseling, 151.7 to 181.0 cm at milking and 169.1 to 208.1 cm at harvest stage of maize (Table 1). The results revealed that at all growth stages of maize, 'Nutriseed pack' registered higher plant height when compared to farmers practice. This obvious effect of 'nutriseed pack' could be attributed to placement of N, P and K fertilizers in the root zone, which would have synergistically induced crop growth (Kalaiselvi and Arulmozhiselvan, 2013). The lowest height of maize hybrid registered in recommended dose of fertilizer followed by farmers practice plots irrespective of the growth stages

TABLE 1
PLANT HEIGHT OF HYBRID MAIZE AT DIFFERENT STAGES

Treatment	Vegetative stage (cm)	Tasseling stage (cm)	Milking stage (cm)	Harvesting stage (cm)
TO 1 - Farmer Practice	48.6	119.4	151.7	169.1
TO 2 - RDF Dose of Fertilizer	70.2	138.3	170.4	191.5
TO 3 - Nutriseed pack	75.1	151.9	181.0	208.1

3.2 Dry matter production

Dry matter production of maize crop recorded at vegetative stage, tasseling stage, milking stage and harvest stage ranged from 2350 to 5006, 5946 to 7821, 6471 to 9588 and 7890 to 11469 kg ha^{-1} respectively (Table 2). The highest dry matter production of 5600 kg ha^{-1} at vegetative stage, 7821 kg ha^{-1} at tasseling stage, 9588 kg ha^{-1} at milking stages and 11456 kg ha^{-1} at harvesting stage were recorded in treatments that received continuous application of nutrients through 'nutriseed packs'. This might be due to deep placement of NPK fertilizers and enriched manure in the root zone. Similar findings were observed by Muhammad *et al.* (2002).

TABLE 2
DRY MATTER PRODUCTION OF HYBRID MAIZE (kg ha^{-1})

Treatment	Vegetative stage	Tasseling stage	Milking stage	Harvesting stage
TO 1 - Farmer Practice	2350	5946	6471	7890
TO 2 - RDF Dose of Fertilizer	3642	4675	8311	10156
TO 3 - Nutriseed pack	5006	7821	9588	11469

3.3 Yield attributes and yield of maize

The yield and yield attributing parameters *viz.*, number of grains per cob, 100 grain weight cob length was recorded (Table 3). Number of grains per cob, 100 grain weight and cob length ranged between 469.22 to 547.2, 30.5 to 35.6 g and 18.84 to 20.26 cm respectively. Yield attributes were high in 'nutriseed pack' over other treatments. This might be the indication of

adequate supply of nutrients at all critical stages of the plant growth. Similar results were observed by Singh and Singh (2006).

The grain yield ranged between 65.44 to 74.00 q ha^{-1}. Among the technologies, Nutriseed pack technology was recorded more yield of 74.00 q ha^{-1} (13.08% increased yield over control) than that of 71.92 q ha^{-1} recommended dose of fertilizers applied in the field followed by farmers practice (65.44 q ha^{-1}). The results revealed that enriched manure pellet was more effective on increasing yield of maize over surface application of fertilizer. Radhika (2010) reported that Nutriseed Pack with Furadan resulted in the highest grain yield of 5290 kg ha^{-1} under surface irrigation, which was 832 kg higher than surface broadcast; and of 4489 kg ha^{-1} under drip irrigation, which was 525 kg higher than surface broadcast. Placement of Nutriseed Pack with 125% NPK was comparable to 100% NPK Nutriseed Pack with Neem, Furadan, manure + fertilizer mixture indicating a saving of 25% N, both under surface and drip irrigation.

Similar findings were observed by Asha and Arulmozhiselvan, (2006), Kalaiselvi and Arulmozhiselvan (2013), Muthukrishnan and Arulmozhiselvan (2013) and Hota *et al.*, (2017).

TABLE 3
YIELD AND YIELD PARAMETER OF HYBRID MAIZE

Treatment	Grain yield (q ha^{-1})	No. of grains / cob	100 grain weight (g)	Cob length (cm)
TO 1 - Farmer Practice	65.44	469.22	30.5	18.84
TO 2 - RDF Dose of Fertilizer	71.92	499.54	32.7	19.72
TO 3 - Nutriseed pack	74.00	547.2	35.6	20.26

3.4 Economics

The economics of the trial showed that the highest net return (Rs. 59500) with the Cost Benefit ratio of 2.01 were obtained in Nutriseed pack technology when compared to farmers practice (B:C ratio 1.50).

IV. CONCLUSION

In conclusion, we can say that nutrient support is provided by Nutriseed pack to the highest extent to the plant in the root zone. Weeds have less chance to tap the nutrients from Nutriseed Pack. Slow release of nutrients support the crop throughout the cropping period and results in higher yields. The Nutriseed pack technique has shown better result than any other fertilizer placement or application because of pelleted form as well as point placement and also has proven to reduce the fertilizer dose and increase the fertilizer use efficiency. Hence, Nutriseed pack technology was found to be a novel way of achieving high yield in hybrid maize.

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