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Bunch yield in banana var Nendran under good agricultural practises and Jeevamrutha application

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Abstract
Banana being highly nutrient exhaustive crop requires all the nutrients in balanced proportion. A field experiment was conducted to evaluate the GAP based on soil test and Jeevamrutha on bunch yield of Banana. Var Nendran. The four treatments included were Control, package of practices of Kerala Agricultural University for nutrients (POP of KAU for nutrients), Jeevamrutham and GAP based on soil test. Jeevamrutham is an organic fertilizer and a great replacement of chemical fertilizers. It enhances Microbial activity in soil and helps in improvement of soil fertility. The results revealed that highest bunch yield in treatment with GAP based on soil test (T4). Number of fingers per bunch was significantly higher in T4 (41.6) followed by T2 (38.2) and lowest in control (30.8).

Keywords: Jeevamrutham, INM, Nendran, GAP, organic farming

Introduction
Nendran Banana is Kerala's most famous variety as the coastal land of Kerala is home to a variety of bananas. Nendran covers almost 40-50% of banana cultivation in Kerala. The average yield of this variety is only about 4.35 t/ha against the average yield potential of 25 – 30 t/ha. It occupies an area of 56,211 ha with a production of 3,83,102 t in the State. There are several reasons categorized for its lower productivity which include imbalanced and unscientific use of chemical fertilizers and pesticide, yield loss due to pests and diseases, and intensive cultivation. Large amount of nutrients are required for high yields of quality fruits because of its large size and rapid growth rate require relatively. It is estimated that 320kg N, 925kg K_2O and 32kg P_2O_5 is removed 50 tons of banana every year (Lahav and Turner, 1983) [1]. For maintenance of soil fertility and plant nutrient supply to an optimum level, Integrated nutrient management (INM) was found to be beneficial for sustaining the desired crop productivity through optimisation in an integrated manner the benefits from all possible sources of plant nutrients.

Practices that address social sustainability, economic and environmental sustainability for on-farm processes, that result in safe and quality food and non-food agricultural products which are collectively called Good Agricultural Practices (GAP). GAP are particularly important in the banana industry, not only for sustainability of production and minimization of environmental impact, but also to ensure hygienic practises in packaging, transport and harvesting activities to deliver safe and good quality fruit to consumers.

Organic farming is an emerging area in India and the export potential of organic products is increasing across the world. Due to the changing preferences worldwide towards organic and eco-friendly products, an increasing impact on Kerala's rich endowments was made which include agricultural crops especially spices, plantation and fruit crops, medicinal plants etc. This makes the state an ideal destination for promotion of organic farming. Jeevamrutham serves as the rich source of microorganism and is completely organic that solubilize phosphorus, that fix nitrogen and also it is the rich source of carbon, nitrogen, phosphorus, potassium and many micronutrients (Devakumar *et al.*, 2014; Kaur, 2020) [3, 4]. Jeevamrutham enriches the soil with indigenous microorganism as it contains improvised preparation that are required for mineralization from native cow urine, cow dung, Jaggery and horse gram. All of them are marketed under favourable cost (Gore and Sreenivasa, 2011) [5]. Keeping this in view, the present study was initiated to find out the bunch yield in banana under systems of organic farming using Jeevamrudham, INM and GAP in banana variety Nendran.

Materials and Methods

The experiment was conducted in Banana variety "Nendran" in the year 2021-22 at RARS farm. Field experiment was laid out in Randomised Block Design with four treatments and five replications having a plot size of 4 m x 4 m and spacing of 2 m x 2m. For assessing soil nutrient status, preliminary soil samples were collected and analysed for pH, electrical conductivity, organic carbon, macro (N,P,K), secondary, micro nutrient and microbial analysis as shown in table 1. The four treatments comprised of control (T1), POP of KAU for nutrients (T2), Jeevamrutham (T3) and GAP based on soil test (T4).The soil samples were tested for beneficial microbial load before introducing Jeevamrutham, INM and GAP using the procedure suggested by Cappucino and Sherman, 2013 in table 2. Jeevamrutham was prepared using 5 kg cow dung, 10 litre cow urine, 1kg Jaggery, 1kg pulse flour and 500 g soil from the same field mixed them with 100 litre water in a big tank properly and kept the tank in shade and covered it with jute bag and left. The mixtures were kept for incubation under shade for 5 days and stirred vigorously daily. Application of Jeevamrutham carried out at the rate of 5 litres per plant in basins monthly at first six months of planting. Different yield parameters and biometrics were recorded during the study period. Disease incidence and pest control were also noted. At full maturity bunches were harvested as indicated by the finger angle disappearance (Patil and Patil, 2017) [6].

Results and Discussion

The results revealed that highest bunch yield in treatment with GAP based on soil test (T4) as shown in table 3 and the yield was 7.46 kg/bunch. Treatment T4 was significantly superior to all other treatments. This was followed by T2 and T3 (treatment with RDN as per POP and Organic farming using Jeevamritha as source of nutrient respectively) with a yield of 5.48kg and 5.28kg per bunch respectively. Lowest bunch yield was reported in control. Number of fingers per bunch was significantly higher in T4 (41.6) followed by T2 (38.2) and lowest in control (30.8). Treatments found significant at 1% and 5% level of significance. Even though highest number of hands were obtained in T4 (4.6), significant difference was not observed between the treatments. Microbial population was highest in the treatment with Jeevamrutham as shown in table 4. Similar experiment with Jeevamrutham was done on (Musa AAB) nendran which concluded highest bunch yield of banana ie., 7.69 kg/plant using treatment of jeevamrutham (3.0 percent bunch spray 15 and 30 days after emergence and bunch covering) on comparing with treatments of panchagavyam vermiwash and cow's urine (Sreejith, 2014) [8].

Table 1: Chemical properties of the soil

Sl. No	Parameter	Concentration
1	pH	4.36
2	EC	0.0371dS/m
3	Organic Carbon	2.62%
4	Available Phosphorus	54.85kgha^{-1}
5	Available Potassium	166.0 kgha^{-1}
6	Calcium	263 ppm
7	Magnesium	57.8 ppm
8	Sulphur	158.50
9	Fe	398 ppm
10	Mn	14.35 ppm
11	Zn	4.25 ppm
12	Cu	2.80 ppm
13	Boron	0.216 ppm

Table 2: Soil microflora before the field experiment (Cappucino and Sherman (2013))

Sample Number	Bacteria X 10^7CFU/ml	Fungi X10^4CFU/ml	Actinomycetes X10^4 CFU/ml	Azospirillum X10^5 CFU/ml	Azotobacter X10^5 CFU/ml	P-Solubilizer X10^4CFU/ml
.	9.5	6.0	20.5	1.5	1.0	Nil
.	20.0	18.5	1.5	1.5	1.5	1.5

Table 3: Effect of treatments on bunch yield and yield attributes

Treatments	Bunch yield kg/plant	No. of fingers/bunch	No. of hands/bunch
T1	3.13	30.800	3.600
T2	5.48	38.200	4.000
T3	5.28	36.800	3.800
T4	7.46	41.600	4.60
	CD (0.05)0.496	CD(0.05) 4.918	NS

Table 4: Soil microflora after the harvest (Cappucino and Sherman (2013))

Sample No.	Bacteria X10^7CFU/ml	Fungi X10^4CFU/ml	Actinomycetes X10^4 CFU/ml	Azospirillum X10^5CFU/ml	Azotobacter X10^5CFU/ml	P-Solubilizer X10^4CFU/ml
T1	7.5	8.0	18.0	1.5	1.0	nil
T2	9.5	10.5	19.5	1.5	Nil	1.0
T3	16.5	27.0	23.5	2.0	1.0	1.5
T4	9.0	9.5	18.0	1.5	Nil	1.0

Conclusion

Banana being highly nutrient exhaustive crop requires all the nutrients in balanced proportion. The study to find out the bunch yield in banana under systems of organic farming, INM and GAP in banana variety Nendran concluded that bunch yield in banana was significantly higher under GAP than organic farming with Jeevamrutha, and recommended dose of nutrients as per POP of KAU.

Conflict of interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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