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Effect of different farming systems on moisture content and biomass production of banana

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Abstract
To achieve objective *i.e.* to compare the performance of different forms of farming systems on yield and economics banana experiment was carried out during the year 2023-24. The field experiment was conducted at Organic Farm, ASPEE College of Horticulture, NAU, Navsari using large plot technique with five treatments and six sampling points (repetition). The treatments were T_1: Natural farming (Jivamrut), T_2: Panchgavya krushi, T_3: Rishi krushi (Amrutpani), T_4: Organic manure @ 12 t/ha and T_5: Conventional farming. moisture content of banana fruit, leaf and stem remained unaffected by farming systems, fresh and dry weights were significantly influenced**,** with Conventional farming practice by use of recommended dose of fertilizer (300-200-200, N-P_2O_5-K_2O g/plant with 5 t/ha of biocompost) showing clear superiority in biomass production. However, enriched organic systems such as Panchagavya and Rishi Krishi demonstrated promising performance and may serve as sustainable alternatives with moderate biomass production over natural farming.

Keywords: Banana, natural farming, Panchgavya krushi, Rishi Krushi and conventional farming

Introduction
Banana (*Musa paradisiaca* L.) is a large herbaceous perennial monocotyledonous and monocarpic plant. Banana belongs to the family *Musaceae* in order *Scitamineae*. Banana is known as "Apple of Paradise". Its origin is the tropical region of South-East Asia. Banana crop has nutritional, medicinal and industrial values. Banana has been associated with man as food and is used for religious work. In addition, banana is one of the most important fruit crops of the world. Indeed, many consider banana one of man's first food. Banana is rich source of easily digestible carbohydrates with a calorific value of 67-137 per 100 g fruit. It is a good source of vitamin A and vitamin C (100 mg/100 g) and fair source of vitamin B and B_2. Fruits are also rich source of minerals like Mg, Na, K, P and a fair source of Ca and Fe. In India, Banana occupies an area of about 948 thousand hectares producing 37614 thousand MT with the productivity 39.7 t/ha, whereas in Gujarat it is grown over 59.68 thousand hectares with production of 4010.7 thousand MT with the productivity of 67.2 t/ha during the 2024-25 (Anon., 2025a) [1]. South Gujarat is the main banana producing hub in Gujarat. In South Gujarat, Banana occupies an area of about 26.33 thousand hectares producing 1983 thousand MT with the productivity of 75.3 t/ha during the 2024-25 (Anon., 2025b) [2].
Due to the conventional farming system crop yield is increased but simultaneously it deteriorates soil and produce quality due to the over and unscientific use of chemical fertilizers, pesticide, fungicides, *etc.* The use of different pesticides and fungicides for the crop protection their traces are found in food which is consumed by humans and is badly affecting the human health. Area under organic farming is increasing day by day due to the increasing demand for organic foods as well as government effort for the promotion of organic farming. Farmers are practicing different forms of organic farming *viz*., Rishi krushi, Panchgavya krishi, Gau-Krupa Amritam Krushi, Bio-dynamic farming, Natural farming *etc.* However, limited scientific information is available related to the feasibility of different forms of organic farming. Organic and natural farming is promoted by the government and launching many schemes to support to those directly and indirectly involved in this farming system such as Mission Organic Value Chain Development for North Eastern Region (MOVCDNER), National Mission on Sustainable Agriculture, *Paramparagat Krishi Vikas*

Yojana (PKVY), Sub-mission on Agro Forestry (SMAF), *Rashtriya Krishi Vikas Yojana, etc*. Keeping these views in mind, the present experiment conducted.

Materials and Methods

Field experiment was conducted at Organic Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari during the year 2023-24, in Plot No. F-17. For the conventional farming, planting was done in on plot F-23 at College Farm, N. M. College of Agriculture, Navsari Agricultural University, Navsari. A large plot technique with five treatments and six sampling points (repetition) was employed for the field experiment. The treatments were T_1: Natural farming (Jivamrut), T_2: Panchgavya krushi, T_3: Rishi krushi (Amrutpani), T_4: Organic manure @ 12 t/ha and T_5: Conventional farming. Following a large plot technique, statistical analysis of the experimental data was performed using analysis of variance. Calculated "F" value and tabulated "F" value were contrasted at a 5% level of significance.

- **Natural Farming treatment (T_1):** Ghanjivamrut was incorporated @ 1.5 t/ha (472 g/plant) as a basal application as well as rice straw mulch @ 5 t/ha. Jivamrut @ 500 L/ha was applied at monthly interval up to 6 months after planting.
- **Panchgavya Krushi treatment (T_2)**: 12 t/ha (3.78 kg/plant) of biocompost was applied at basal dose and Panchgavya was applied at 50 L/ha at monthly interval up to 6 months after planting.
- **Rishi Krushi treatment (T_3):** 12 t/ha (3.78 kg/plant) of biocompost was added as a basal dose as well as rice straw mulch @ 5 t/ha. Amrutpani @ 500 L/ha was applied at monthly interval up to 6 months after planting.
- **Treatment T_4:** 12 t/ha (3.78 kg/plant) of biocompost was applied as basal dose.
- **Conventional Farming treatment (T_5):** Recommended fertilizer dose (300-200-200, N-P_2O_5-K_2O g/plant) along with 5 t/ha (1.57 kg/plant) of biocompost. Nitrogen was applied in four equal splits (75 g/plant each) at the 2nd, 3rd, 4th and 5th months after planting. Phosphorus was applied once after the 3rd month, while potash was supplied in three equal splits (67 g/plant each) during the 3rd, 4th and 5th months of crop growth.

Note: Ghanjivamrut and biocompost were applied on a dry weight basis as basal inputs. Mulching with rice straw was done after planting.

Results and Discussion

The results presented in Table 1 indicated that the moisture content of banana fruit, leaf and stem was not significantly influenced by different forms of farming. Fruit moisture content ranged from 77.11% (natural farming) to 79.14% (rishi krushi)**,** while leaf moisture varied narrowly between 78.40% (conventional farming) and 80.36% (rishi krushi)**.** Stem moisture content remained consistently high across treatments, ranging from 94.72% (conventional farming) to 95.64% (natural farming).

Fresh weight of banana fruit, leaf and stem was significantly affected by different farming systems. The highest fruit fresh weight (27.1 kg/plant) was recorded under conventional farming (T_5), which was significantly superior to all other treatments. Similarly, leaf and stem fresh weights were maximum under CF (3.12 and 23.15 kg/plant, respectively). Among natural and organic-based systems, Panchagavya and Rishi Krishi recorded higher fresh weights compared to natural farming and organic manure, indicating improved vegetative growth under enriched organic inputs. The relatively lower fresh weights under natural farming may be attributed to limited immediate nutrient availability.

Table 1: Effect of different forms of farming on moisture content (%) and weight of Banana fruit, leaf and stem

Treatments	Moisture content (%)			Fresh weight (kg/plant)			Dry Weight (g/plant)		
	Fruit	Leaf	Stem	Fruit	Leaf	Stem	Fruit	Leaf	Stem
T_1: NF	77.11	80.20	95.64	17.0	1.97	15.08	3903.0	387.3	659.2
T_2: PK	78.25	79.56	94.93	19.5	2.43	19.28	4245.7	496.4	975.2
T_3: RK	79.14	80.36	95.36	19.2	2.36	19.11	3994.7	463.7	885.5
T_4: OM	78.22	78.45	95.60	17.9	2.30	18.48	3902.1	497.6	814.5
T_5: CF	78.33	78.40	94.72	27.1	3.12	23.15	5824.4	675.2	1220.7
SEm (±)	0.89	0.93	0.28	0.67	0.07	0.42	196.3	27.4	57.2
CD at 5%	NS	NS	NS	2.0	0.21	1.22	571.7	80.0	166.7
CV (%)	2.8	2.9	0.7	8.2	7.3	5.4	11.0	13.3	15.4

NF: Natural Farming, PK: Panchgavya Krushi, RK: Rishi Krushi, OM: Organic manure @ 12 t/ha and
CF: Conventional Farming

Dry weight accumulation in fruit, leaf and stem showed significant variation among farming systems. conventional farming (T_5) resulted in the significantly highest dry matter accumulation in fruit (5824.4 g/plant), leaf (675.2 g/plant) and stem (1220.7 g/plant), reflecting enhanced biomass production due to readily available nutrients. Among non-chemical systems, panchgavya krushi treatment recorded higher dry weights than natural farming and organic manure @ 12 t/ha, particularly for stem and leaf, suggesting better nutrient assimilation and structural biomass formation.

The present study demonstrated that higher fresh and dry weight of banana observed under the conventional farming system can be attributed to several interrelated factors associated with nutrient availability and plant physiological responses. In conventional farming, chemical fertilizers provided nutrients in readily soluble forms, ensuring a continuous and adequate nutrient supply throughout the crop growth period. This timely nutrient availability supported vigorous vegetative growth, efficient photosynthesis, and healthy root development, resulting in better overall plant performance. In contrast, organic treatments such as T_2 (Panchgavya Krushi), T_3 (Rish Krushi) and T_4 (organic manure @ 12 t/ha) showed moderate performance. While these systems contribute positively to soil health and microbial activity., their slower nutrient release patterns and dependency on microbial mineralization may not always coincide with the crop's peak nutrient demand. In particular, relatively lower nitrogen availability may have limited vegetative and reproductive growth, thereby reducing yield-attributing characters and overall productivity. The results are akin to those reported by Patel (2008) [7], Shaheen *et al.* (2009) [9], Kotur (2015) [5], Hema *et al.* (2016) [3], Sangeeta *et al.* (2017) [8], Mamatha *et al.* (2021) [6] and Kavitha *et al.* (2022) [4].

Conclusion

Although moisture content of banana fruit, leaf and stem remained unaffected by farming systems, fresh and dry weights were significantly influenced**,** with Conventional

farming practice by use of recommended dose of fertilizer (300-200-200, N-P_2O_5-K_2O g/plant with 5 t/ha of biocompost) showing clear superiority in biomass production. However, enriched organic systems such as Panchagavya and Rishi Krishi demonstrated promising performance and may serve as sustainable alternatives with moderate biomass production over natural farming.

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