# 20. ORGANIC FARMING IN BANANA AND GUAVA

**PUJA H. VYAS,** Department of Horticulture, College of Horticulture, Junagadh Agricultural University, Junagadh- Gujarat (India)
**D. R. KANZARIA,** Department of Horticulture, College of Horticulture, Junagadh Agricultural University, Junagadh- Gujarat (India)
**A.M.BUTANI** Department of Horticulture, College of Horticulture, Junagadh Agricultural University, Junagadh- Gujarat (India)

**ABSTRACT**
India is the second largest producer of fruits in the world. With the increasing population, the cultivable land resource is shrinking day to day. Green Revolution in the post-independence era has shown path to developing countries for self-sufficiency in food but sustaining agricultural production against the finite natural resource base demands has shifted from the "resource degrading" chemical agriculture to a "resource protective" biological or organic farming. The major component of organic farming is: manures, green manures, intercropping, mulching, vermiculture biotechnology, bio fertilizers, biodynamic farming, bio control etc. Application of bio-fertilizer was more effective than organic manures in enhancing fruit growth parameters. When bio-fertilizer was grouped together in Red Fleshed guava and banana cv. grand nine, P-solubilizers were found to have more beneficial influence on fruit physico-chemical characteristics than that of N-fixers.

**KEYWORDS**
Organic farming, fruits, quality, yield, control

**INTRODUCTION**

Organic farming system in India is not new and is being followed from ancient time. It is a method of farming system which primarily aimed at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (bio fertilizers) to release nutrient to crops for increased sustainable production in an ecofriendly pollution free environment.

As per the definition of the United States Department Of Agriculture (USDA) study team on organic farming "Organic farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizer, pesticides, hormones, feed additives etc.,) and to the maximum extent feasible rely upon crop rotation, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection".

Food & Agriculture Organization (FAO) suggested that "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystems health, including biodiversity, biological cycle and soil biological activity and this is accomplished by using on-farm

agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs".

**BANANA**

Banana is a large perennial herb with leaf sheaths that form trunk like pseudo stem. Banana has its origin in tropical region of south East Asia. Banana is a nutritious gold mine. They are high in vitamin B6, which helps fights infection and is essential for the synthesis of heme, the iron containing part of hemoglobin. They are also rich potassium and are a great source of fiber. Bananas are fifth largest agricultural commodity in world trade after cereals, sugar, coffee and cocoa. In recent years, considering the adverse impact of indiscriminate use of chemicals, new trend for organic production of banana is increasing in the country.

A new name, i.e. "Green Foods" for this has been coined. This refer to organically grown crops which are not exposed to any chemicals right from source of planting material to the final post-harvest handling and processing.It is based on recycling of natural organic matter.In this system nutritional requirement are met through use of enriched composts, cakes, promotion of green manure, inter and cover crops, mulching etc., while pests and disease are kept below threshold level through integrated crop management.

Banana prefers tropical humid low lands and is grown from the sea level to 1000 m above MSL. Optimum temperature is 27C. Soils with good fertility and assured supply of moisture are best suited. Black loams and sandy loam soils of uplands are favorable for banana. Banana prefers a soil pH of 5.5-7.5.

Prepare the field by ploughing or digging and dig pits for planting. Size of pits depends upon soil type, water table and variety. In general pit size 50 cm x 50 cm x 50 cm is recommended. In low lying areas, take mounds for planting suckers. During summer months, irrigate once in three days. Ensure good drainage and prevent water logging. About 6-10 irrigation per crop may be given depending upon soil conditions.

During early stages, complete control of weeds could be obtained by raising cowpea in the inter spaces. Hand weeding by giving 4-5 surface diggings (depending upon weed growth) will give good weed control. Avoid deep digging. Do not disturb soil after plants start producing bunches. If green manure crop is grown, weeding operations can be reduced to 1-2 diggings. Mulching is an effective practice for controlling weeds.

The crop gets ready for harvest after 11-12 months of planting. First ratoon crop is ready after 8-10 months from harvesting the main crop and second ratoon after 8 months of harvesting of the first ratoon crop.With the conservatives estimate, it is expected that at least 80% of the plants would produce bunches of banana.70.40 t/ha yield obtain in third year after planting in organic farming of banana.

**GUAVA**

Guava is one of the leading fruit crop in India due to its wide adaptability to varying soil and climatic conditions. In the Indo-Gangetic alluvial soils of West Bengal, the crop has immense potential in increasing productivity and yield sustainability. It is rich source of minerals, vitamin-C and pectin.

Guava is such a horticultural crop, where fruits are usually consumed fresh after harvest along with skin and pulp, hence there is feasibility of organic farming in its cultivation. Integrated application of different fertilizers, organic manures and bio-fertilizer in guava improved the vegetative growth parameters, yield and fruit quality.

Indiscriminate use of chemical fertilizers, Weedicides and pesticides has resulted in various environmental and health hazards along with socio-economic problems.The entire agricultural community is trying to find out an alternative sustainable farming system which is ecologically sound, economically and socially acceptable. There is a great need to standardize eco-friendly technologies for the production of safe and residue free organic guava for getting high economic returns.Though systematic work on manuring of guava was started since 1960 in India, limited systematic work on organic fruit production of guava has been reported.

Guava is grown in both tropical and subtropical region up to 1500 m. above m.s.l. It tolerates high temperature and drought conditions prevalent in North India in summers. However, it is susceptible to severe frost as it can kill the young plants. An annual rainfall of about 100 cm. is sufficient during the rainy season (July-Sep). Heavy clay to very light sandy soils having pH between 4.5-8.2are suitable for cultivation of guava. The crop is sensitive to water-logging. Land is prepared during the summer season by ploughing, harrowing, leveling and removing weeds.

Guava plants are vegetatively propagated by budding, inarching or air layering. In guavaSquare system of planting is generally adopted. Pits of 1x1x1m. Size dug before the monsoon and filled with a mixture of farmyard manure and soil.

The young guava plants need irrigation at weekly intervals during summer. Irrigation is also essential to check excessive fruit drop during summer. Normally irrigation is not required in guava plantation. However, in the early stage, young guava plants require 8 to 10 irrigation a year. Lifesaving hand watering is necessary in summer season in dry areas and on light soils. Drip irrigation has been proved to be very beneficial in organic farming of guava.

Mulching at the base of tress can be done using organic residues such as straw, dried grass and banana leaves. Mulching with organic materials should be 12-15 cm thick to arrest the weed growth and simultaneously permit rain water penetration to the root zone.Mulching is prevent soil surface evaporation and conserve water, enhance growth, besides controlling weeds.

Guava fruit mature for harvesting after 4-5 months of anthesis .The quality of guava depends on the season of the cropping. Winter crop gives better quality fruits then rainy season.The maturity indices of the fruit are the change in dark green to light green color.The guava plant starts commercial yield from 3 year onward under good management practices.Under irrigated conditions guava yield about 100-150 kg fruit for 8 year and above age tree in organic farming.

## REVIEW

### *Effects of FYM and inorganic fertilizers*

### Guava

Chaudhary et al. (1975) reported that high rates of inorganic NPK plus FYM gave the best growth, yields and fruit quality in Allahabad Safeda guava.

Wagh and Mahajan (1985) reported that good tree growth and the highest yield (46 kg / tree) from Sardar guava trees receiving NPK at 600: 300: 300 g / tree + basal dressing of 25 kg FYM / tree in Sardar guava.

Bhobia et al. (2005) recorded higher fruit yield (85 kg / plant) with the application of 40% nitrogen through inorganic (urea) + 60% nitrogen through organic (FYM) sources in guava cv. Hisar Surkha.

### Banana

Gubbuk et al. (1993) conducted an experiment on the effects of different

nitrogen and farmyard manure levels on the stem and finger growth and the durations of fruit development of Dwarf Cavendish and Basrai banana clones grown in heated glass house. They reported that with FYM, highest stem and finger growth rates obtained with 225 kg / mat for Dwarf Cavendish and 150 kg / mat for Basrai. FYM but not N reduced the time required for fruit development.

Subramanian and Pillai (1997) stated that the combined application of 25 kg FYM + 0.5 kg neem cake / plant and 25 kg of zinc sulphate / ha improved the growth and bunch characters as well as rectifying the Zn deficiency symptoms of red banana.

Enrique Alvarez et al. (2001) conducted an experiment to study growth, yield and leaf nutrient content of organically grown banana plants in the-Canary Island. Growth parameters (height, leaf emission rate and pseudo stem circumference) and yield parameters (bunch weight, number of hands and fingers) were measured during 10 months in an organically grown banana plantation (cv. Dwarf Cavendish). Leaf emission rates showed higher values in late spring and early summer (0.099-0.109 leaf / day) while pseudo stem circumference grew more in late spring (0.238 cm / day) than in summer. In August, pseudo stem circumference decreased dramatically, probably because plants with a large circumference flowered before that month and could not be measured. Bunches gave good yields (43.59 kg) and had a high mean number of hands (12.79). Number of finge2rs of the second upper hand (25.63), length (23.5 cm) and weight (165.19 g) ranged from normal to high. Month of harvesting influenced the yield and fruit quality.

Doran et al. (2003) studied the effect of compost prepared from waste material of banana plants in comparison to FYM. They compared three doses of this compost (15, 30 and 45 kg / plant) with FYM (50 kg / plant), mineral fertilizers (180 g N + 150 g P + 335 g K / plant) and FYM + mineral fertilizers (25 kg FYM + 180 g N + 1 50 g P + 335 g K / plant). Their results showed that application of 45 kg / plant of compost to banana found more suitable in terms of economical production and organic farming than the other fertilizer types.

## EFFECTS OF CASTOR CAKE ON GROWTH, YIELD AND FRUIT QUALITY

Banana

In four season trials with the cv. Basrai banana, Chundawat et al. (1983) reported that the average yields were similar for all treatments but economically. The best treatment was urea + castor cake (1: 1). This treatment also gave an average yield of 50.5 t / ha and a gross income of Rs.27,797 / ha compared with the lowest income of Rs.23,058 / ha after treatment with ammonium sulphate.

## EFFECTS OF VERMICOMPOSTING ON GROWTH, YIELD AND QUALITY BANANA

Athani et al. (1999) reported that the treatment of banana plant with 75% recommended rate of fertilizers (180-108-225 g NPK / plant) + 2 kg vermicompost recorded the least number of days of shooting after planting and total crop duration.

Patel (2008) conducted a trial on banana by using different organic manures and observed that the yield and yield contributing characters in Grand Nain banana like length of finger, girth of finger, no. of finger / bunch and no. of hands per bunch obtain under organic manures (vermicompost and castor cake each at 3 kg / plant or vermicompost 2 kg / plant + neem cake 2 kg / plant + castor cake 2 kg / plant or vermicompost 3 kg / plant + neem cake 3 kg / plant or poultry

manure 7.5 kg / plant + castor cake 3 kg / plant) were almost equal to obtain under recommended dose of fertilizer. The quality of fruits in organic banana was better than that of the banana produced under inorganic farming. The highest net realization was noted under organic banana in which banana plant fed with 3 kg each of vermicompost and castor cake.

**EFFECT OF BIO FERTILIZERSGUAVA**

Ram and Rajput (2000) found that application of Azotobacter resulted in significantly higher weight of individual fruit (246.57 g)CV. Allahabad Safeda as compared to uninoculated control (162.17 g). Azotobacter application also resulted in increased number of fruits (111) per plant and yield (14.25 kg) per plant as compared to 54 fruits / plant and 7.07 kg per plant, respectively in uninoculated control.

Banana

Dibut et al. (1996) found that Azotobacter inoculation stimulated all the phenological variables like plant height, girth and number of leaves of banana. They reported that in both the clones i.e. Giant Cavendish and Burrow CEMSA, no significant differences were observed in growth variables when treated by 80% N with Azotobacter or by 100% N alone and concluded that bacteria inoculation could compensate for 20% of the N fertilizer without affecting the growth parameters.

Chezhiyan et al. (1999) reported that maximum bunch weight of 15.3 kg in Virupakshi cultivar was registered with treatment of biofertilizers viz., Azospirillium (3 g), phosphobacterium (3 g) and VAM (5 g) and organic manure i.e. FYM along with 75% RDF. Patel (2003) reported that the higher yield of banana per plant was obtained from the plants treated with integrated supply of organic and biological sources of nitrogen. The maximum yield was recorded by the treatment combination of 300 g inorganic nitrogen with Azotobacter @ 6 kg / ha.

**EFFECT OF ORGANIC FARMING ON LEAF NUTRIENT CONTENT**

***Guava***

Bhobia et al. (2005) stated that the leaf nitrogen content was highest in guava cv. Hisar Surkha when 100% nitrogen (800 g / plant) phosphorus and potassium were maximum when whole nitrogen was supplied through inorganic fertilizers, whereas, added organically (FYM). Leaf composition of 1.76% N, 0.20% P and 0.87% K was associated with highest yield.

***Banana***

Gubbuk et al. (1991) studied the effect of different application rates of nitrogen and farmyard manure on the nutrient concentrations in leaves of banana cultivars Cavendish and Basrai. Nitrogen at 0, 80, 160 or 320 g / mat and FYM at 0, 75, 150 or 225 kg / mat, in various combinations were applied to greenhouse plants. Increasing rates of N reduced the foliar concentrations of N and K; other nutrient concentrations were not markedly affected by N applications. Increasing FYM rates significantly increased the foliar K, Ca and Zn; in both cultivars, foliar N was highest with 225 kg / mat.

Goyal et al. (1992) reported higher nitrogen uptake by banana plants with the addition of FYM due to higher availability of nitrogen by microbial biomass.

**CONCLUSION**

During the last four decades of the 20th Century, the global population doubled itself from 3 to 6 billion and it is estimated that by the year 2020, it will reach the 8 billion mark. It has also been noticed that the volume of population from 3000 BC to 1950 is almost same or less from 1950 to 2030. It means that the galloping

explosion of population has been made during last 5-6 decades only. Food and nutritional security is therefore a serious global concern. Neither conventional farming with inorganic alone nor organic farming only with the use organic input can face this challenge. To meet out the food and nutritional security, organic farming helps to improve the quality of fruit crops.

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