RESEARCH ARTICLE Agricultural Science Digest, Volume 40 Issue 3: 270-274 (September 2020)

Effect of Organic Liquid Manure of *Kunapajala* on Growth and Yield of Bhindi [*Abelmoschus esculentus* (L.) Moench.]

S.R. Kavya, K. Ushakumari

10.18805/ag.D-5083

ABSTRACT

Kunapajala is a fermented liquid organic manure mentioned in Vrikshayurvedha and now a days popular among farmers. A field experiment was conducted to evaluate the soil and foliar efficacy of 2% and 5% herbal and non- herbal *Kunapajala* on plant growth by using bhindi. *Kunapajala* treatment was compared with inorganic fertilizers, Panchagavya and fish amino acid. Foliar application of 5% non-herbal *Kunapajala* recorded the highest growth and yield attributes such as plant height (124.4 cm), number of branches (3.73), leaf area index (1.42), dry matter production (3845.51 kg ha^{-1}, number of fruits per plant (25.5), length of fruits (15.24 cm), girth of fruits (7.22 cm), average fruit weight (20.8 g) and yield (20.78 t ha^{-1}).

Key words: Bhindi, Fish amino acid, *Kunapajala*, Panchagavya, Yield.

INTRODUCTION

Continuous use of chemical fertilizers has hardened the soil, reduced fertility, polluted air and water and released harmful gases, thus bringing threat to soil, plant and ultimately human health. In order to pertain the ecological diversity for future generations to maintain a balance the human race should be more responsible to take up on ecofriendly measures of agriculture. This increasing responsibility leads our nation to propose, promote and perpetuate organic farming. We are at a verge to adopt the essential principles and practices of our traditional way of farming. Long back itself Indian had remarkable awareness and knowledge of the importance of organic farming. Use of organic manures can satisfy the food and nutrition needs of the society and will pave the way for sustainable production. Among the manures, organic liquid manures are promising and they are 20% more effective than others. The plant can absorb nutrients about 20 times faster through the leaves (Pathak and Ram, 2013). Liquid organic manures are aqueous products prepared from the plant or animal derivatives can work as nutrient sources and bio pesticides. Use of traditional liquid organic manures such as Panchagavya, Fish Amino Acid (FAA) and *Kunapajala* is considered as viable means for enhancing crop growth and production.

The liquid bio fertilizer, *kunapambu* or *Kunapajala* (kunapa= corps, jala=water), was appropriately named because non-herbal *Kunapajala* involved fermentation of the animal remains, such as flesh, marrow, etc. and was used since ancient times in India. The complex molecules like proteins, fats, carbohydrates get broken down into simpler molecules during fermentation, thus becoming readily available to plants (Deshmukh *et al*., 2012). Herbal *Kunapajala* is commonly available and widely used by the farmers in organic farming. *Kunapajala* can be applied to any crop at any growth stage.

Vegetables are important part of healthy eating and provide a source of many vitamins and minerals. The nutrients in vegetables are vital for health and maintenance of human body. Eating a diet rich in vegetables may reduce risk for stroke, cancer, heart diseases and diabetes. Among the different vegetables cultivated in Kerala, bhindi [*Abelmoschus esculentus* (L.) Moench.] gained its own place because of its nutritional value and benefits. Considering the challenges and importance of vegetable production without compromising environmental safety, we are at the border to adopt organic means of cultivation. Use of organic liquid manures such as *Kunapajala* ensures rapid availability of nutrients and sustainable production.

Department of Soil Science and Agricultural Chemistry, College of Agriculture, Vellayani, Thiruvananthapuram-695 522, Kerala, India.

Corresponding Author: S.R. Kavya, Department of Soil Science and Agricultural Chemistry, College of Agriculture, Vellayani, Thiruvananthapuram-695 522, Kerala, India.
Email: srkavyaa@gmail.com

How to cite this article: Kavya S.R. and Ushakumari, K. (2020). Effect of Organic Liquid Manure of *Kunapajala* on Growth and Yield of Bhindi [*Abelmoschus esculentus* (L.) Moench.]. Agricultural Science Digest. 40(3): 270-274.

Submitted: 11-11-2019 **Accepted:** 14-01-2020 **Published:** 15-07-2020

MATERIALS AND METHODS

Herbal and Non-herbal *Kunapajala*

Herbal *Kunapajala*

• Weed leaves	:	20 kg
• Cow dung	:	10 kg
• Sprouted Black gram	:	2 kg
• Jaggery	:	2 kg
• Cow's urine	:	15L
• Water	:	80L

Non herbal *Kunapajala*

- Meat/Fish : 2kg
  or
- Egg : 25nos
- Bone meal : 1 kg
- Rice husk : 1 kg
- Coconut oil cake : 1 kg
- Sprouted Black gram : 500g
- Water : 85L
- Fresh Cow dung : 10kg
- Cow's Urine : 15 L
- Honey : 250g
- Ghee : 250g
- Jaggery : 2kg
- Milk : 1L

Panchagavya

- Fresh Cow dung : 7 kg
- Cow's Urine : 10 L
- Ghee : 1 kg
- Milk : 1 L
- Curd : 2 L
- Water : 10 L
- Tender coconut water : 3 L
- Jaggery : 3kg
- Poovan Banana : 12 nos

FAA

- Fish: Jaggery; 1:1 ratio

The experiments were carried out at Model Organic Farm under the Department of Soil Science and Agricultural Chemistry, College of Agriculture, Kerala Agricultural University, Vellayani (8°50' N latitude and 76°90' E longitude and 29m above MSL), Trivandrum, Kerala, during the year 2018-2019. The soil of the experimental site was sandy clay loam. Bhindi variety 'Varsha Uphar' was used for the field experiments. The experiment was carried out in Randomized block design with thirteen treatments with three replication. The treatments comprised of KAU Package of Practices (T_1), Organic Adhoc POP (T_2), Organic Adhoc POP + 3% Panchagavya (T_3), Organic Adhoc POP + 5% Fish Amino Acids (T_4), 50% N as FYM + Water (T_5), 50% N as FYM + 2% Herbal *Kunapajala* soil application (T_6), 50% N as FYM + 5% Herbal *Kunapajala* soil application (T_7), 50% N as FYM + 2% Non- Herbal *Kunapajala* soil application (T_8), 50% N as FYM + 5% Non-Herbal *Kunapajala* soil application (T_9), 50% N as FYM + 2% Herbal *Kunapajala* foliar application (T_{10}), 50% N as FYM + 5% Herbal *Kunapajala* foliar application (T_{11}), 50% N as FYM + 2% Non-Herbal *Kunapajala* foliar application (T_{12}), 50% N as FYM + 5% Non- Herbal *Kunapajala* foliar application (T_{13}). Vermicompost at 1 t ha^{-1} was applied for the treatments T_2, T_3 and T_4 at 10 days interval. Herbal and non- herbal *Kunapajala* was applied as per the treatments at 10 days interval.

The biometric observations were recorded from the representative plants in each plots. The data on growth, yield and yield attributes were statistically analysed. Statistical analysis of the experimental data was subjected to analysis of variance techniques as described by Cochran and Cox (1965). F test is followed in ANOVA for testing the significance of treatments. CD was calculated for the treatments that were found significant.

RESULTS AND DISCUSSION

The data presented in the Table 1 indicated that the effects of treatments on height of bhindi plants was found to be significant. Treatment receiving 50% N as FYM + 5% non-herbal *Kunapajala* as foliar application recorded the highest plant height at first harvest (74.93 cm) and final harvest (124.40 cm).The lowest value was registered by 50% N as FYM + Water (T_5) at first harvest (45.27 cm) and the final harvest (87.07 cm) and was significantly inferior than all other treatments (Fig 1).

The highest mean value for number of branches (3.73) was observed by the treatment 50% N as FYM + 5% Non-Herbal *Kunapajala* foliar application (T_{13}) which was found to be significantly different from all other treatments. Foliar application of 5% non- herbal *Kunapajala* recorded significantly the highest dry matter production (3845.51 kg ha^{-1}). Leaf area index at first harvest was significantly influenced by the treatments and the best index (1.42) was reported with foliar application of 5% non- herbal *Kunapajala* along with 50% N as FYM (Table 1).

The results indicated that days taken for first flowering varied significantly among the treatments. The treatments receiving 5% fish amino acid, 5% herbal *Kunapajala* as foliar application and 2%non-herbal *Kunapajala* as soil application flowered earlier and was found to be on par with T_{12}, T_{13}, T_{10}, T_9, T_7 and T_1. Treatment receiving foliar application of 5% non -herbal *Kunapajala* recorded 50% flowering at the earliest and which was found to be on par with 50% N as FYM + 2% Non-Herbal *Kunapajala* foliar application (T_{12}) and 50% N as FYM+ 5% Non-Herbal Kunapajala soil application (T_9) (Table 2) The treatment with 5% non- herbal *Kunapajala* as foliar application had recorded the highest (25.5) number of fruits per plant and which was found to be on par with 50% N as FYM + 2% Non-Herbal *Kunapajala* foliar application (T_{12}). 50% N as FYM + 5% Non- Herbal Kunapajala foliar application (T_{13}) recorded the highest length, girth of fruits and average fruit weight (Fig 2).

The treatment 50% N as FYM + 5% Non- Herbal Kunapajala foliar application (T_{13}) recorded the highest yield and which was found to be on par with treatment 50% N as FYM + 2% Non-Herbal Kunapajala foliar application (T_{12}), (Fig 3).

The application of organic liquid manures significantly enhanced the plant growth parameters due to the better and rapid availability of essential plant nutrients. *Kunapajala* application enhanced the growth attributes and these observations are in lines with the report of Brajeshwar, (2002), Mishra (2007), Deshmukh *et al*. (2012), Ali *et al*. (2012), Sarkar *et al*. (2013) and Ankad *et al*. (2017).

Table 1: Number of branches, Leaf area index and dry matter production as influenced by different treatments on *bhindi*.

Treatments	Number of branches per plant	Leaf area index	Dry matter production (kg ha^{-1})
T_1: *KAU POP (FYM 20 t ha^{-1}, NPK 110:35:70 kg ha^{-1})*	2.60	0.99	3066.44
T_2: *Organic Adhoc POP* T_2	2.80	0.39	2971.48
T_3: *Organic Adhoc POP + 3% Panchagavya* T_3	1.87	0.56	3092.09
T_4: *Organic Adhoc POP + 5% Fish Amino Acids* T_4	2.43	0.59	2875.34
T_5 *: 50% N as FYM + Water*	1.70	0.33	2525.21
T_6: *50% N as FYM + 2% herbal Kunapajala soil application*	2.80	0.54	2733.19
T_7: *50% N as FYM + 5% herbal Kunapajala soil application*	2.40	0.78	2771.02
T_8: *50% N as FYM + 2% non-herbal Kunapajala soil application*	2.47	0.87	3240.86
T_9 *: 50% N as FYM + 5% non-herbal Kunapajala soil application*	2.50	0.81	3326.97
T_{10}: *50% N as FYM + 2% herbal Kunapajala foliar application*	2.60	0.84	3563.04
T_{11}: *50% N as FYM + 5% herbal Kunapajala foliar application*	2.77	0.80	3565.31
T_{12}: *50% N as FYM + 2% non-herbal Kunapajala foliar application*	3.17	1.03	3682.24
T_{13} *: 50% N as FYM + 5% non-herbal Kunapajala foliar application*	3.73	1.42	3845.51
SE	0.119	0.099	10.25
CD(0.05)	0.345	0.29	30.09

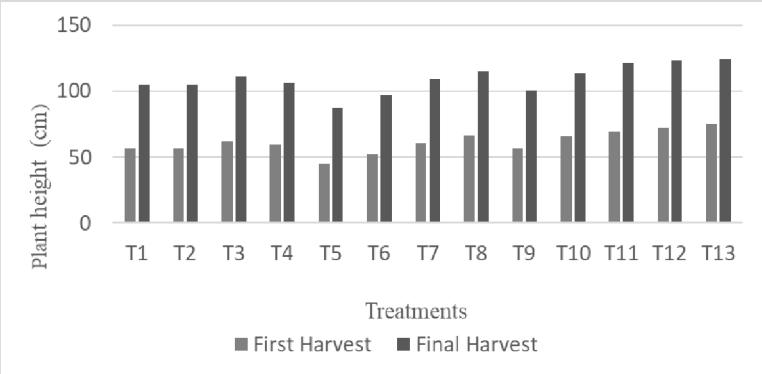

Fig 1: Effect of treatments on plant height.

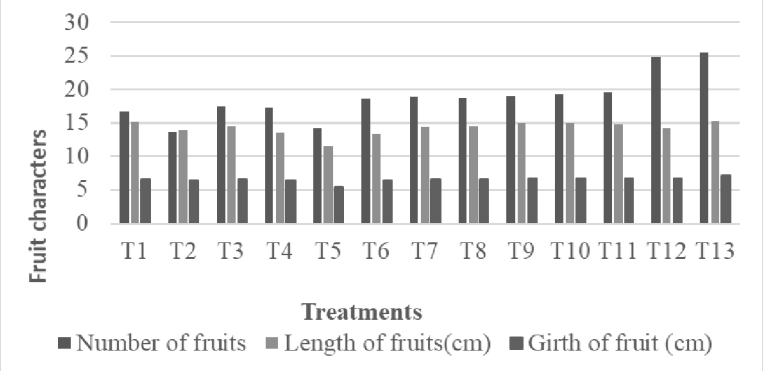

Fig 2: Effect of treatments on fruit characters of *bhindi*.

Increased plant height might be due to increased uptake of nutrients. The sustained availability of higher levels of nitrogen from *Kunapajala* had resulted in higher plant height and leaf area. The better growth resulted by the foliar application of non- herbal *Kunapajala* may be due to the rapid availability of essential nutrients to the plants. The plant can absorb nutrients about 20 times faster through the leaves than if they are applied through the soil. *Kunapajala* application increased the length, diameter and fresh weight of fruits in tomato (Deshmukh *et al*., 2012). This might be due to the presence of hormones, enzymes and growth regulators in *Kunapajala*. Growth promoters, enzymatic activity and supply of nutrients through the foliage on the addition of liquid manures may increase the duration of crops

Table 2: Effect of treatments on days to first flowering and days to 50% flowering of *bhindi*.

Treatments	Days to first flowering	Days to 50% flowering
T_1: *KAU POP (FYM 20 t ha^{-1}, NPK 110:35:70 kg ha^{-1})*	36.33	41.00
T_2: *Organic Adhoc POP* T_2	37.00	42.00
T_3: *Organic Adhoc POP + 3% Panchagavya* T_3	37.00	41.67
T_4: *Organic Adhoc POP + 5% Fish Amino Acids* T_4	36.00	41.33
T_5: *50% N as FYM + Water*	39.33	45.67
T_6: *50% N as FYM + 2% herbal Kunapajala soil application*	37.00	41.00
T_7: *50% N as FYM + 5% herbal Kunapajala soil application*	36.33	41.33
T_8: *50% N as FYM + 2% non-herbal Kunapajala soil application*	36.00	41.67
T_9 : *50% N as FYM + 5% non-herbal Kunapajala soil application*	36.67	40.67
T_{10}: *50% N as FYM + 2% herbal Kunapajala foliar application*	36.67	41.33
T_{11}: *50% N as FYM + 5% herbal Kunapajala foliar application*	36.00	41.00
T_{12}: *50% N as FYM + 2% non-herbal Kunapajala foliar application*	36.33	39.67
T_{13} : *50% N as FYM + 5% non-herbal Kunapajala foliar application*	36.33	39.33
SE	0.286	0.495
CD(0.05)	0.833	1.448

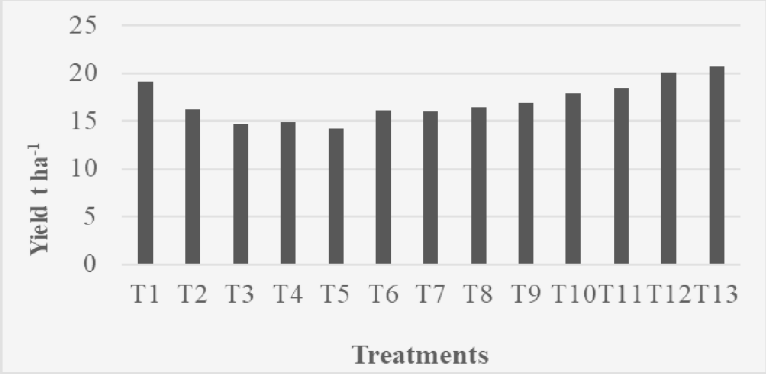

Fig 3: Effect of treatments on Yield (t ha^{-1}) of *bhindi*.

(Vemaraju, 2014). The fermentation of liquid manure breaks down into simpler forms, making it rapidly available to plants than the traditionally applied organic matter. The nutrients are readily available to the plants from the liquid organic manure. This might be the reason for better yield attributes of bhindi. Similar results were obtained also by the application of Panchagavya and fish amino acid (Muthuvel, 2002; Vemaraju, 2014; Krishnan, 2014; Parvathy, 2017 and Dhanalakshmi, 2017). *Kunapajala* is a rich source of beneficial micro organims and these might be the reason for better yield and yield attributes of bhindi. The beneficial micro-organisms presented in the *Kunapajala* may produce growth hormones like IAA and GA and resulted in improvement in plant growth.

CONCLUSION

Application of 50% N as FYM + 5% non-herbal *Kunapajala* as foliar application (T_{13}) was the best treatment which resulted in the highest growth, yield and yield attributes of bhindi and yield was on par with the treatment T_{12} (50% N as FYM+ 2% non-herbal *Kunapajala* as foliar application). Application of non-herbal *Kunapajala* along with 50% N as FYM as foliar spray is essential to get higher crop yield in organic farming and inorganics can be substituted with foliar spray of *Kunapajala* along with quality organic manures. Present study confirmed that *Kunapajala* is a promising and eco-friendly plant stimulant for sustainable crop production and safe agro ecosystem.

REFERENCES

Ali, M.N., Chakraborty, S. and Paramanik, A. (2012). Enhancing the shelf life of kunapajala and shasyagavya and their effects on crop yield. International Journal of Bio-resource and Stress Management. 3: 289-294.

Ankad, M.G., Hiremath, J., Patil, R.T. and Hedge, G.V. (2017). Evaluation of *kunapajala* and *panchagavya* on plant quality, physiology, biochemistry, yield and growth attributes: A case study of *Withania somnifera* Dun. Journal of Ayurveda and Integrative Medicine. 30: 1-5.

Brajeshwar (2002). Effect of different agronomic practices on Senna (*Cassia angustifolia* Vahl.). M.Sc. thesis, Gujarat Ayurveda University, Jamnagar. pp. 124.

Dhanalakshmi, V.N. (2017). Validation of liquid organic manures and their effect on crop productivity. M.Sc. (Ag) thesis, Kerala Agriculture University, Thrissur. pp. 75.

Deshmukh, R.S., Patil, N.A. and Nikam, T.D. (2012). Influence of kunapajala treatment from vrikshayurveda on leaves of tomato (*Lycopersicon esculentum* L. cv. Selection 22) and its comparison with conventional farming and organic farming. IOSR Journal of Pharmacy. 2: 55-63.

Krishnan, R.V. (2014). Nutrient management in organic farming of cucumber (*Cucumis sativus* L). M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur. pp. 109.

Mishra, P.K. (2007). Effect of kunapa jalam vrikshyurveda on growth of paddy. Indian Journal of Traditional. Knowledge. 6: 307-310.

Muthuvel. (2002). Effect of organics on growth and yield of bhindi var. Varsh Uphar. In: *Glory of Gomatha.* Proceedings of a National conference, Tirupati andhra Pradesh. S.V. Veterinary University, Tirupati andhra Pradesh. pp. 143-148.

Parvathy, S.U. (2017). Characterization and evaluation of on-farm liquid organic manures on soil health and crop nutrition. Ph.D. thesis, Kerala Agricultural University, Thrissur. pp. 101.

Sarkar, S., Kundu. S.S. and Ghorai, D. (2013). Validation of ancient liquid organics panchagavya and kunapajala as plant growth promoters. Indian Journal of Traditional. Knowledge. 13: 398-403.

Vemaraju, A. (2014). Liquid formulations for production of organic oriental pickling melon (*Cucumis melo* var. common L.). M.Sc. (Ag) thesis, Kerala Agricultural University, Thrissur. pp. 80.