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Preface

We would like to present, with great pleasure, the inaugural volume-9, Issue-5, May 2023, of a scholarly journal, *International Journal of Environmental & Agriculture Research*. This journal is part of the AD Publications series *in the field of Environmental & Agriculture Research Development*, and is devoted to the gamut of Environmental & Agriculture issues, from theoretical aspects to application-dependent studies and the validation of emerging technologies.

This journal was envisioned and founded to represent the growing needs of Environmental & Agriculture as an emerging and increasingly vital field, now widely recognized as an integral part of scientific and technical investigations. Its mission is to become a voice of the Environmental & Agriculture community, addressing researchers and practitioners in below areas.

Environmental Research:

Environmental science and regulation, Ecotoxicology, Environmental health issues, Atmosphere and climate, Terrestric ecosystems, Aquatic ecosystems, Energy and environment, Marine research, Biodiversity, Pharmaceuticals in the environment, Genetically modified organisms, Biotechnology, Risk assessment, Environment society, Agricultural engineering, Animal science, Agronomy, including plant science, theoretical production ecology, horticulture, plant, breeding, plant fertilization, soil science and all field related to Environmental Research.

Agriculture Research:

Agriculture, Biological engineering, including genetic engineering, microbiology, Environmental impacts of agriculture, forestry, Food science, Husbandry, Irrigation and water management, Land use, Waste management and all fields related to Agriculture.

Each article in this issue provides an example of a concrete industrial application or a case study of the presented methodology to amplify the impact of the contribution. We are very thankful to everybody within that community who supported the idea of creating a new Research with *IJOEAR*. We are certain that this issue will be followed by many others, reporting new developments in the Environment and Agriculture Research Science field. This issue would not have been possible without the great support of the Reviewer, Editorial Board members and also with our Advisory Board Members, and we would like to express our sincere thanks to all of them. We would also like to express our gratitude to the editorial staff of AD Publications, who supported us at every stage of the project. It is our hope that this fine collection of articles will be a valuable resource for *IJOEAR* readers and will stimulate further research into the vibrant area of Environmental & Agriculture Research.

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Fields of Interests

Agricultural Sciences	
Soil Science	Plant Science
Animal Science	Agricultural Economics
Agricultural Chemistry	Basic biology concepts
Sustainable Natural Resource Utilisation	Management of the Environment
Agricultural Management Practices	Agricultural Technology
Natural Resources	Basic Horticulture
Food System	Irrigation and water management
Crop Production	
Cereals or Basic Grains: Oats, Wheat, Barley, Rye, Triticale, Corn, Sorghum, Millet, Quinoa and Amaranth	Oilseeds: Canola, Rapeseed, Flax, Sunflowers, Corn and Hempseed
Pulse Crops: Peas (all types), field beans, faba beans, lentils, soybeans, peanuts and chickpeas.	Hay and Silage (Forage crop) Production
Vegetable crops or Olericulture: Crops utilized fresh or whole (wholefood crop, no or limited processing, i.e., fresh cut salad); (Lettuce, Cabbage, Carrots, Potatoes, Tomatoes, Herbs, etc.)	Tree Fruit crops: apples, oranges, stone fruit (i.e., peaches, plums, cherries)
Tree Nut crops: Hazlenuts. walnuts, almonds, cashews, pecans	Berry crops: strawberries, blueberries, raspberries
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Bees	Dogs
Exotic species	Chicken Growth
Aquaculture	
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Milk Production (Dairy)	
Dairy goat	Dairy cow
Dairy Sheep	Water Buffalo
Moose milk	Dairy product
Forest Products and Forest management	
Forestry/Silviculture	Agroforestry
Silvopasture	Christmas tree cultivation
Maple syrup	Forestry Growth
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General Farm Machinery	Tillage equipment
Harvesting equipment	Processing equipment
Hay & Silage/Forage equipment	Milking equipment
Hand tools & activities	Stock handling & control equipment
Agricultural buildings	Storage

Agricultural Input Products	
Crop Protection Chemicals	Feed supplements
Chemical based (inorganic) fertilizers	Organic fertilizers
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Environmental science and regulation	Ecotoxicology
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Terrestric ecosystems	Aquatic ecosystems
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Management of Temple Flowers: A step towards Environmental Sustainability

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Abstract— *India is a diverse country with many religions, and worship and offerings to deities play a significant role in people's daily lives. Floral offerings are commonly used in religious ceremonies and are a symbol of devotion and respect, therefore, temples generate a large amount and variety of flower waste. When not properly disposed of, temple waste, including floral waste, can end up in landfills or water bodies, where it can cause environmental problems. Discarded floral waste can also harm wildlife, clog drainage systems, and contribute to water pollution. Here we will discuss about the temples of Ayodhya, Uttar Pradesh. The majorly offered flowers in temples are marigold, rose, jasmine, chrysanthemum, hibiscus, etc. Tagetes erecta commonly called marigold is offered in tremendous amounts, so there is an urgent need to manage it sustainably. The primary product we extracted is the essence named 'Pushpsar' and secondarily essential oil from it. These flowers contain secondary metabolites, so the essential oil has significant medicinal value. Furthermore, the slurry by-product is used to make bio fertilizers, overall the flower waste which was disposed off earlier in the Holy Saryu River, now used as valuable products in sustainable modus.*

Keywords— Essential Oil, Flower Waste, Marigolds, Steam Distillation, Temple waste.

I. INTRODUCTION

In India, the most populated nation, religion is a way of life, and various religious festivals are celebrated occasionally. Various religious rituals are performed in temples, gurudwaras, churches, dargahs, mosques, hotels, banquets, and houses, in which a variety of items, including sweets, garlands (flowers), fruits (edible and non-edible), etc., are offered to gods (Yadav et al., 2015; Samadhiya et al., 2017). In these ceremonies, floral waste has considerable fractions, which have been discarded after a single use. These flowers are disposed into water bodies, thereby polluting them (Burnley, 2007), or dumped onto open lands, causing environmental pollution (Wijayapala, 2013). Being an offering to God, flowers do not find their way to the conventional waste disposal system because of religious beliefs.

According to Puranik, (2019) it is a wrong assumption that flower waste is biodegradable in nature, so it can be discarded anywhere for decomposition. Dumping of flowers in water bodies or open landfills consequence in environmental hazards (Singh et al., 2013). Dumping of flower waste in rivers/ponds/lakes results in a threat to the aquatic ecosystem as it decreases the amount of dissolve oxygen. Such kind of activity significantly affect the aquatic organisms (Mahindrakar, 2018). Some of the major harmful effects are as follows:

- Drainage system and waterways connected to the water bodies get clogged (Maity and Kumar, 2016)
- Dumping of floral waste on roadsides and open places gives murky look to an area and distorts the image (Waghmode et al., 2018)
- Flower waste disposal initially increases the organic load which may tend to enhance the growth of weeds and microorganism in the aquatic ecosystem (Makhania and Upadhyay, 2015).
- Decomposing flowers releases several kinds of nutrients which trigger algal growth resulting in eutrophication.

- Places of devotion apart from flower waste generate a lot of single-use plastic waste in terms of plastic bottles and plastic bags (Bhatia, 2018; Mehta, 2013).
- Floral waste can create a hideous appearance in public spaces and negatively impact the natural beauty of areas like Ghats.

Due to the availability of high organic content as well as the lack of proper handling strategies the degradation of flowers is a very slow process (Jadhav et al., 2013). Every year approximately 80,00,000 tons of flowers are dumped in the rivers in India choking them to death (Maity and Kumar, 2016). With the increase of the human population, the number of visitors is also increasing which consequentially contributes to the generation of an enormous amount of flower (Samadhiya et al., 2017). Disposal of temple flowers are a major challenge throughout India (Padmavathiamma et al., 2008; Murthy, and Naidu, 2012; Wani et al., 2013).

Temple waste causes a foul odor after degradation which creates air, water, and land pollution. Human health is also affected by the generation of pollution (Vankar et al., 2009). Thus, there is a necessity for a proper and eco-friendly process for floral waste disposal. Flowers like Marigold (Tagetes spp.) and rose (Rosa damascene) are used to make incense sticks and rose water. Moreover, various other products such as herbal colors, natural dyes, medicine, decorative items, paper, food production, sugar syrup, pigments, biosurfactants, biofuels, compost, bioethanol can also be incorporated from these flowers (Bhattacharya, et al., 2012; Ranjitha, et al., 2014; Waghmode, et al., 2016). Several value-added goods can be prepared from the flowers which is being dumped simply. Figure 1 shows the list of different items prepared from flower waste as waste to wealth concept. At present management of floral waste is being done to reduce the pollution load. Environment friendly methods are adapted to manage and treat these floral wastes in a cost-effective way. The net result of such practices is to develop useful products on sustainable manner (Bundela, et al., 2010; Jain, 2016). The present study aims to explore the different pathways for the sustainable utilization of flower waste being generated in the various temples of Ayodhya. Furthermore, to aware and generate income to the farmers and job opportunities to local peoples.

FIGURE 1: Flower waste to value added products.

II. MATERIAL AND METHODS

Ayodhya: Ayodhya is counted as one of the seven sacred cities in the Hindu faith. As we all know that many times large gatherings, leftover the footprint of pollution of the environment. This is due to the lack of awareness and mismanagement. Ayodhya is situated on the banks of River Saryu is a spiritual Centre also known as Saket an ancient city of India. Ayodhya is historical and religious and its peaceful Ghats and various temples attract thousands of devotees to visit this city and to take a holy dip in the river Saryu.

2.1 Set up of Pilot Project:

The distillation unit is set up on a pilot scale at the premises of Dr. Rammanohar Lohia Avadh University Ayodhya, U. P. This pilot project is established as "Pilot Cum Demonstration Project Distillation of Flowers from Temples of Ayodhya". This pilot project was started as a joint venture with the technical support of "Fragrance & Flavour Development Centre (FFDC), Kannauj, Uttar Pradesh" a Government of India, autonomous body under the Ministry of MSME. A large steam distillation unit is fabricated with the help of M/S Swaraj Herbals Machinery Private Limited, Barabanki U. P. which is completely made of SS grade 304. This steam distillation unit contains one large container for cooking flowers, one condenser, one collecting tank, and a recycling pipe that connects the pipes of the collection tank and cooking tank to avoid overflow. The cooking tank is fitted with three immersion rods supplied with three-phase electricity, to cook the flower at a high temperature. A line diagram of the steam distillation unit has been shown in Figure 2.

2.2 Collection of flowers:

Ayodhya is recognized as a major pilgrim place, attracting a great number of devotees from all around the country. The increase in the number of visitors contributes to the generation of enormous flower waste. The majorly offered flowers in temples are marigold, rose, jasmine, hibiscus, etc. along with some leafy and edible and non-edible fruits. Marigold is offered in tremendous amounts in almost all the temples. Every day these flowers offered in temples are left idle and therefore, become a problem for waste management. The floral waste is directly disposed into the ponds & rivers, etc. which has an adverse impact on the water quality, as well the aquatic organisms.

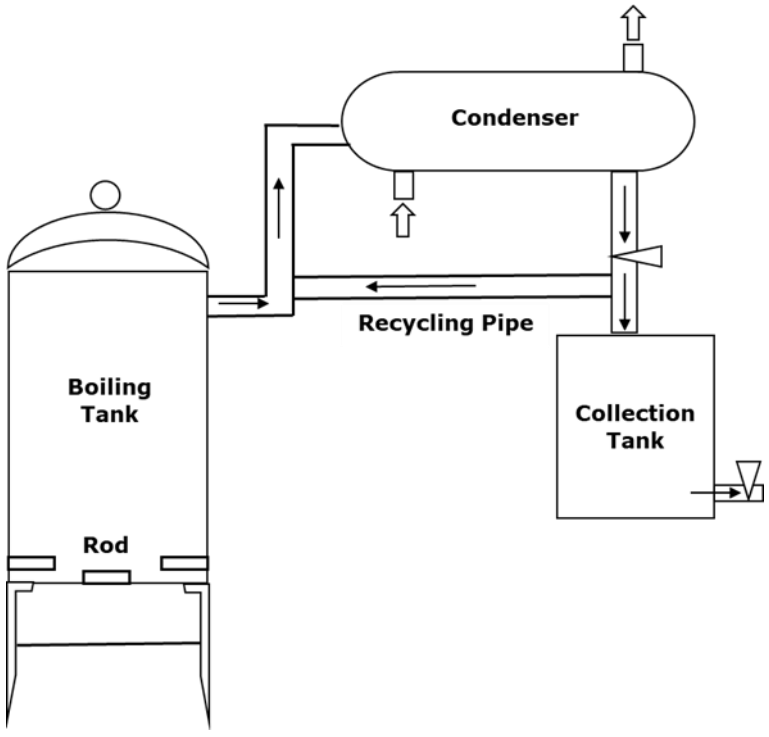

FIGURE 2: Steam Distillation Unit

The flower waste was collected from major temples such as Hauman Gadhi, Naka, Hanuman Gadhi Ayodhya, Saryu Mata Mandir, Chireshwar Nath Mandir. The flowers from different temples were collected with the help of trucks of Nagar Nigam, Ayodhya and unloaded at the segregation point near the pilot plant. After the collection of flowers, non-biodegradable part like plastic, and coconut shell was removed by hand sorting and only good quality flowers are segregated. The degraded flowers are disposed of in nearby composting pits for further degradation by microorganisms to produce compost.

2.3 Distillation:

The distillation starts with the loading of segregated flowers into the cooking tank. The tank is filled with water as per the standard ratio of flower and water. As the machine is turned on the immersion rod fitted in the cooking tank starts heating the water leading to boiling and ultimately vaporization. It is well known that under high temperature and pressure the flavonoids and secondary metabolites of the flowers come out. In the next step of distillation, as the vaporization starts the vapors are directed to the condenser unit. In this part, the volatiles get condensed and collected to the collecting tank with the help of interconnected pipes. By this, the final product is collected as flowery water.

FIGURE 3: Transportation vehicle and segregation of flowers.

2.4 Oil extraction:

The steam distillation unit ends with the production of flowery water. This flowery water is again repeated for the extraction of essential oil from it. For this process, we filled 500 ml of separating funnel with the freshly made essence from the plants, and put it stable for 24 to 48 hours, within this duration the oil from the essence separates easily forming a top dense layer in the separating funnel. The water and essential oil were collected separately. After separating the oil part from the essence, we used the centrifugation process (4000 RPM for 10 minutes) for further refining of the oil. After the essential oil was extracted, we performed an HPLC analysis of the oil to know about the secondary metabolites and phenolic compounds.

III. RESULT AND DISCUSSION:

3.1 Essence Estimation:

HPLC analysis was performed in the extracted oil of flowers. To identify and quantify the secondary metabolites and phenolic compounds present in it. (TABLE 1)

TABLE 1
THE IDENTIFICATION OF PHENOLIC COMPOUND(S)

Wavelength	Compound	Standard RT (min)	Sample RT (min)
280 nm	Gallic acid	6.68	7.12
	Catechin	12.51	Not found
	Syringic acid	20.57	20.61
	Cinnamic acid	24.37	24.25
3030 nm	Resveratrol	22.82	22.87
330 nm	Chlorogenic Acid	15.46	Not found
	Ferulic acid	20.30	Not found
	Caffeic acid	22.37	22.34
360 nm	Rutin	22.51	22.45
	Quercitin	23.76	23.71

After the essential oil was extracted, we performed HPLC analysis of the oil to know about the secondary metabolites and phenolic compounds present in it, the qualitative determination of the chemical compounds analysed was accomplished by the comparison of the retention times (RT) of the phenolic compounds determined in the standard mixture chromatogram to the compounds found in the sample chromatogram at each compounds' specific wavelength. The wavelength used for identification for cinnamic acid, syringic acid and gallic acid were 280 nm, 303 nm for resveratrol and 330 nm for caffeic acid, ferulic acid and chlorogenic acid and 360 nm for the detection of quercetin and rutin. Thus, several compounds, like quercetin, chlorogenic acid, caffeic acid were not detected.

IV. CONCLUSION

Improper management and dumping of flowers change the soil, water, and air quality of the environment of the temple of Ayodhya. This study proposes an alternative approach for the waste management since the waste could be used as a resource for manufacturing useful products. It would further help temples in generating additional revenues. Floral waste utilization would eventually be beneficial to society as individuals would get to live in a cleaner and healthier environment.

Earlier the flowers gathered at the temples of Ayodhya, were directly disposed of in River Saryu or nearby open areas thereby causing water pollution. Diverting temple flowers to the pilot project for the extraction of flowery water and essential oil is ultimately reducing water pollution load of the river Saryu. This pilot project converts the flower waste into different useful products. The primary product we obtained from our distillation plant is the essence of the flower named PUSHPSAR and secondarily we extracted Essential oil. The remaining is being converted into biofertilizer, so these three products are being formed at the present time. The essential oil and the flowery water are of great economic value. The main objective of this pilot project is to develop the skills of temple flower management and earn money form this waste as well as generating empowerment for the youth.

Hence awareness campaign is being created among the pilgrims, authorities of temple, and municipality to adopt this practice to have a clean and healthy environment and financial independence. The generated floral waste can used for making natural colors, rose water, essence, natural dyes, incense sticks, handmade papermaking too. This will help in reducing the problem of the overburdened waste disposal. The eco-friendly (“green temple concept”) can prove to be helpful in Government policy formulation for waste management and in promoting a sustainable development approach toward temples.

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Application of Compost APT01 on Apple Crop (10.0-10.5 years)

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Abstract— *Production of apple tends to decrease because of soil degradation. Objectives of this study are to determine the addition of compostAPT01 to increase fruit production in apple crop.This study aims to analyze the effect of the type and amount of compost APT01 as the soil organic matter to the apple crop production at 3 and 4 months of a day after defoliation and at harvest time (SR3, SR4 and SPN). The experiment was carried out according to completely randomized factorial design with the amount of compost APT01 and the season time of production. The experiment was conducted in 600 square meters. Organic materials of mud cake was fermented for 3 weeks. The amount of compost APT01 as much as 40, 60, and 80 kg per tree was applied a day after defoliation. A total of 27 apple trees aged about 10.0 - 10.5 years with a distance between trees 2-3 meters were randomly selected. Observations made during fruit growth 3 and 4 months after giving compost (SR3 and SR4) and at harvest (SPN). The parameters measured were the number and weight of fruit per tree. Results were analyzed variance, two-way ANOVA with interaction ($\alpha = 0.05$), using Microsoft Excel. The addition of compost APT01 as much as 40, 60 and 80 kg per tree increasing the number and weight of fruit from initially 5.71 kg (58.84 fruits) to 9.99 kg (95.46 fruits) and 12.12 kg (104.06 fruits) respectively. Moreover, it also improves quality grade in terms of the average fruit produced from 9.56-10.22 fruits/kg (grade AB) to 8.59 fruits/kg (grade AA).*

Keywords— organic; apple; APT01; compost; defoliation.

I. INTRODUCTION

The land of apple plantation centers used to produce crops usually have a much greater erosion of land with natural vegetation. Increasing of erosion causes by the replacement of the structure of forest plant roots which bind the soil strongly with a weaker root structure of agricultural crops [1]. This is reinforced by the application of farming system that uses high fertilizers and chemical pesticides and likely increases from year to year, both in quality and quantity, which in turn exceeds the carrying capacity of the land. As a result, the land is being damaged and production declines [2]. Such these conditions force us to constantly seek new breakthroughs for land use that can meet the needs of the community while helping to conserve resources and minimize the impact of external land. One form of such breakthrough was the addition of organic fertilizer such as compost given twice a year. Some of the literature mentioned that the content of organic matter in Java agricultural land is less than 1% which is ideally should be more than 2% [3]. The carbon organic deficiency is an indicator in the excess of chemical fertilizer.

Based on the test results, the number of organic fertilizer needed by the apple plant which have 0.79% organic content in soil is 30 – 50 kg per tree [4]. The organic fertilizer can be derived from agriculture waste and manure, household waste or even from the sugar cane industry known as mud cake. Mud cake waste generated by the sugar mills are dirty, brownish watery and smelled which disturb the surrounding community, therefore need to be composted to become organic fertilizer.

Basic principles of composting procedures has been widely discussed in the literature [5]. Aerobic composting of organic material is a humification process of unstable organic matter (C/N ratio >25) to become stable, characterized by the release of heat and gas from composted substrates. Composting duration varies from 2 to 7 weeks, depending on the type of

decomposers and composting techniques used [6]. Level of maturity and stability in compost determine compost quality shown by the various changes in the physical, chemical and biological compost substrate.

The interest of public to improve soil fertility is by applying compost as an organic filler. Farming communities are encouraged to convert agricultural waste such as corn stalks and grasses used as raw material to make compost. Quality of compost produced depends on the raw materials and the treatment of the composting process [7]. Previous research [8] showed that raw materials which have a C/N ratio > 60:1 will produce poor quality compost. Therefore, organic material with high carbon content is required to be mixed with low-carbon organic material, in addition to high levels of nitrogen.

The mud cake containing cellulose about 3.8% of milled cane. Organic matter content in the mud cake about 75-80% which is mainly in the form of cellulose. The mud cake waste is largely taken by farmers for ground fill or dumped in open fields which can cause air pollution and unpleasant smell around the area [9].

Processing of organic material into compost can be considered as a sustainable technology because it is in accordance with conservation of environment. In addition, the use of compost (organic fertilizer) can reduce chemical fertilizers application [10].

Results of previous studies on chemical analysis tests showed that the average content of the soil organic matter in Bumiaji Batu is less than 1%. Ideally, organic matter contained in the soil should be more than 3%. The process of composting organic materials can be accelerated by the addition of *Trichoderma viride* APT01 as biocatalyst that can decrease the C:N and total organic carbon which was originally 26.8 and 37.6% to 14.6 and 22.7% [11].

II. METHODS

Implementation of field research began February to October 2022 in an apple crop "Anna" of 600 square meters located in the area of Tulungrejo, Bumiaji, Batu, Indonesia. The age of the plant approximately 10.0-10.5 years, with a distance between plants 2-3 meters. The experiment was conducted in 600 square meters. Organic materials of mude cake was fermented by *Trichoderma Viride* APT01 for 3 weeks. The amount of compost APT01 as much as 40, 60, and 80 kg per tree was applied a day after defoliation. A total of 27 apple trees aged about 10.0 - 10.5 years with a distance between trees 2-3 meters were randomly selected. Observations made during fruit growth 3 and 4 months after giving compost (SR3 and SR4) and at harvest (SPN). The parameters measured were the number and weight of fruit per tree. Results were analyzed variance, two-way ANOVA with interaction ($\alpha = 0.05$), using Microsoft Excel.

III. RESULTS AND DISCUSSION

The observation of the number and weight of fruit per plant by adding compost APT01 made during 3 and 4 months after giving compost (SR3 and SR4) and at harvest (SPN) for period-1 and period-2 are shown in Table 1, Figure 1 and Figure 2.

TABLE 1
THE OUTCOME OF THE COMPOST ON THE FRUIT OF PERIOD-1 AND PERIOD-2

	Number of fruit						**Weight of fruit**					
	SR3		**SR4**		**SPN**		**SR3**		**SR4**		**SPN**	
	1	2	1	2	1	2	1	2	1	2	1	2
C40	70.23	75.35	60.37	67.56	58.44	58.23	3.23	3.11	3.78	4.01	5.36	6.05
C60	**107.88**	**112.82**	**96.57**	**98.44**	**94.57**	**96.35**	**3.82**	**4.17**	**6.55**	**7.18**	**9.79**	**10.18**
C80	**112.33**	**120.02**	**107.95**	**110.23**	**103.45**	**104.66**	**4.47**	**4.31**	**7.84**	**7.72**	**12.06**	**12.17**

Descriptions:
1 = period-1 and 2 = period-2. C40 = 40 kg Compost APT01, C60 = 60 kg Compost APT01 and C80 = 80 kg Compost APT01. SR3 = after 3 months composting,
SR4 = after 4 months composting, SPN = the time of harvest.

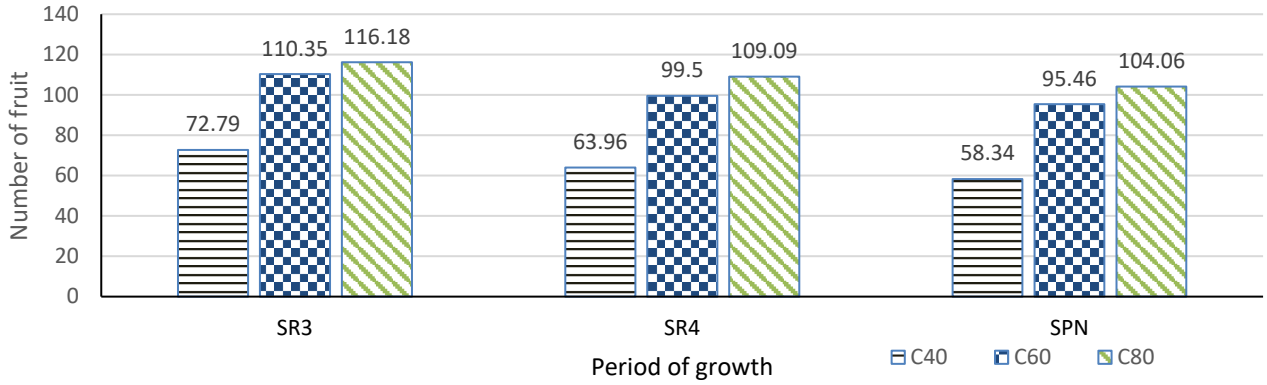

FIGURE 1: The period of growth on the number of fruit

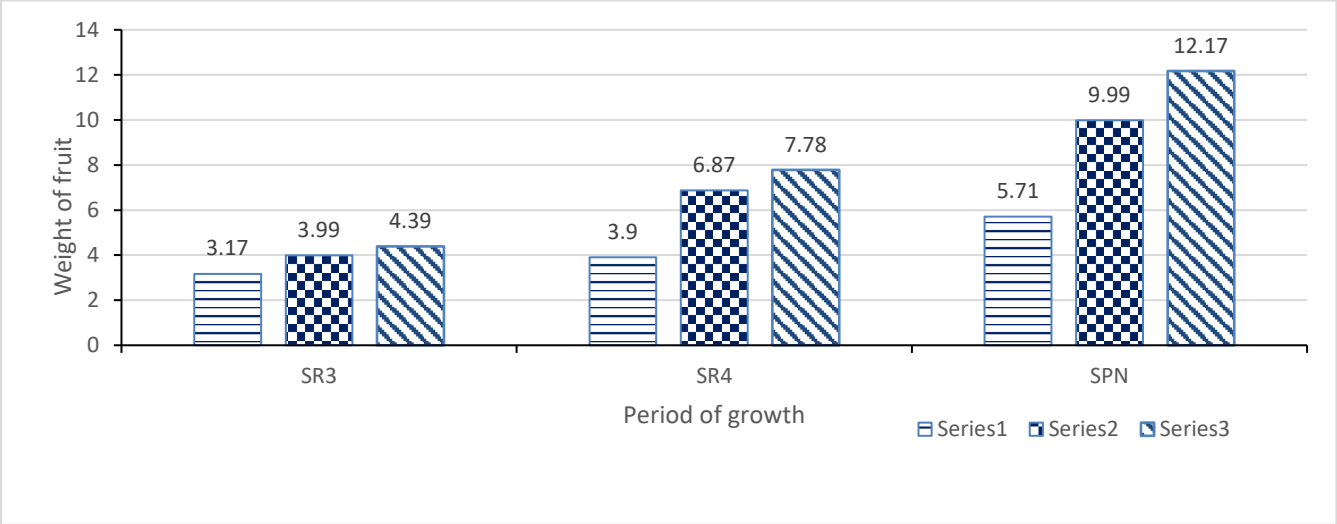

FIGURE 2: The period of growth on the weight of fruit

Data on Table 1 shows reduction in the number of falling fruit on SPN compared to SR3. At SR3, addition of compost APT01 C40, C60, and C80 reducing the amount of the original fruit to fall respectively 19.85%, 13.49%, and 10.43%.

Addition of compost APT01 reducing the amount of the original fruit to fall 16.48-16.49%. Application of compost APT01 directly into the soil cannot be well absorbed by plant roots. This is shown by the growing strength of the fruit stalk during 4 months of composting than during 3 months. Stronger fruit stalk as a result of absorption of potassium and calcium that can be absorbed by plants. Potassium and calcium in the form of positive ions tend to be bound by negatively charged organic compounds to form compounds available to plants. These elements play a role in strengthening elements of plants such as flower and fruit so it does not easily fall out [12]. The amount of fruit during four months after defoliation (SR4) increased from 39.08% to 48.28% by the addition of compost APT as much as 10 and 20 kg per tree. While the percentage of the number of fruit increases at harvest (SPN) ranging between 58.57% and 67.14% [13].

The significant addition of compost improves the content of nutrients such as nitrogen, potassium and phosphorus as well as the number of microorganisms in the soil. This nutrient content has accelerated the growth of the plant tissue [14]. The results of a similar study reported that the addition of potassium and phosphorus influences the amount and weight of the fruit produced per plant [15].

Data on Table 1 shows the apple production of the weight of fruit per plant by adding compost APT01 made during 3 and 4 months after giving compost (SR3 and SR4) and at harvest (SPN) for C40, C60 and C80 respectively 5.71, 9.99, and 12.12 kg. Improvement on fruit size for C40, C60 and C80 respectively 10.22 (grade AB), 9.56 (grade AB) and 8.59 (grade AA).

Production of fruit per plant by the addition of compost APT01 ranging from 3.24-4.22 kg, while on period-2 of 3.97-4.91 kg/plant. The addition of compost APT01 at period-1 is able to increase production 74.51- 135.91% significantly ($\alpha = 0.05$) compared with no addition of compost [12].

Previous research on the use of compost in apple plantations was also carried out in Himachal Pradesh, India. The addition of compost as much as 5-15 kg per tree once a year. The study concluded that the quantity and quality of apples has increased in terms of fruit size, storage time of apple fruits, and soil quality [16]. Improvement on fruit size will have an impact on increasing the value of rupiah. It is known in the market in Batu, Indonesia that the apple grades currently are A, AA, AB and C. Grade A contains 6-7, AA 8-9, AB 10-11 and C 12-15 fruits per kg. The price of grade A > AA > AB > C [13].

The addition of compost APT01 as much as 20 and 30 kg per tree increases the weight and number of fruits was originally 5.3-5.9 kg (62-71 fruits) to 9.0-9.3 kg (89-90 fruits). When it come to the quality grade, the average fruit produced decrease from 12-13 to 10-11 fruits/kg, and can be categorized into Grade C to AB. The research Previously by Caione *et al* (2015), which states that the use of compost of mud cake of 7.5 tonnes / ha can increase the content of phosphorus in the soil, leaves and stalks and crop productivity [17]. The research data of Budiono *et al.* (2015), showed that: (1) Addition of compost APT01 with fermentation time F1, F2 or F3 did not differ significantly ($\alpha = 0.05$) to total fruit production on SR3, SR4, and SPN. This shows that the time required to ferment into compost APT01 by Bio-catalyst was 1 week, (2) The addition of 20, 30, and 40 kg of compost per tree, respectively for F1, F2, and F3 show a significant differences ($\alpha = 0.05$) on the amount of fruit production on SR3, SR4, and SPN, (3) The addition of 30 and 40 kg of compostAPT01 has an impact on increasing the number of fruits from 19 to 29, fruit weight increase from 3.3 to 3.9 kg per tree, and the quality of fruit from grade C (12-13 fruits per kg) to grade AB (10-11 fruits per kg) [18].

IV. CONCLUSION

The addition of compost APT01 as much as 40, 60 and 80 kg per tree increases the number and weight of fruits from 5.71 kg (58.84 fruits) to 9.99 kg (95.46 fruits) and 12.12 kg (104.06 fruits) respectively. Moreover, it also improves quality grade in terms of the average fruit produced from 9.56-10.22 fruits/kg (grade AB) to 8.59 fruits/kg (grade AA).

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