EFFECT OF PANCHAGAVYA ON GROWTH AND YIELDPARAMETERS OF CHILLI (*Capsicum annuum*)

[1]Tamilarasi M, *Esakkiammal B[2] Chairman K[3] and Rajan D[4]

[1]Research Scholar, PG Department of Zoology and Research Centre, Sri Parasakthi College for Women, Courtallam, Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India

[2]PG Department of Zoology and Research Centre, Sri Parasakthi College for Women, Courtallam, Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India

[3]PG Department of Microbiology, Kamarajar Government Arts College, Surandai, Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu, India- 627 859.
[4]TDMNS College, T. Kallikulam. Manonmaniam Sundaranar University, Tirunelveli, Tamilnadu.

ABSTRACT

Panchagavya is an organic product derived from five products evolving from cow and it has been used in Indian medicine since time immemorial. The three direct constituents are cow dung, cow urine and cow milk the two derived products are cow ghee and cow curd and other substances. The present form of Panchagavya can act as a growth promoter and immunity booster to plants. Panchagavya includes several vitamins, macronutrients like N, P, K and micronutrients which might be required for the growth and development of vegetation and additionally consists of various amino acids, growth promoting regulators like Auxins, Gibberellins and also useful microorganisms like *Pseudomonas*, *Azatobacter* and *phosphorus* bacteria etc. The present study is focused on to assess the effect of panchagavya on growth and yield parameters of chilli (*Capsicum annuum*).The results obtained significantly increase over the control.

Keywords: Panchagavya, cow dung, Auxins, Gibberellins, *Azatobacter*

INTRODUCTION

Organic farming is one of the best alternatives to chemical farming and safe guard the soil from further dilapidation (Ali et al., 2011). Organic forming involves the judicious combination of green manures, animal manures, bio fertilizers, bio/ botanical pesticides, and crop rotations, crop residuces. There are several kinds of cow based organic manure such as panchagavya, sanijibani, kunapajala, Amritpani, etc. Panchagavya (Sanskrit; means a combination of five cow products) if formulated properly, is suggested to have miraculous effect on the soil and plants (Geetha and Devaraj, 2013, Rajesh and Jeyakumar 2013; *Choudhary et al., 2014*). Panchagavya is recommended to be used in different forms viz., foliar spray, soil application along with irrigation water, seed or seedling treatment etc.,(Natarajan, 2002) With documented benefits on plant growth and increased produce (*Swaminathan et al., 2007*).

At this juncture, a keen awareness has sprung on the adoption of ‘’Organic forming’’ as a remedy to are the ills of modern chemical agriculture. It is very much essential to develop a strong workable and compatible package of nutrient management through organic resources for various crop based on scientific facts, local conditions and economic viability, In India, organic forming was a well-developed and systematized agricultural practice during the past and this ‘ancient wisdom’ obtained through Indian knowledge systems such as ‘Vedas’ specify the use of ‘’Panchagavya’’ in agriculture for the health of soil, plants and humans.

The increasing concern for environmental safety and global demand for pesticide residue free food has evoked keen interest in crop production using eco – friendly products which are easily biodegradable and do not leave any harmful toxic residues besides conserving nature. So it is necessary to use natural products like panchagavya to produce chemical residue free food crops and hence panchagavya can play a major role in organic forming. (Sivakumar,2014).

Panchagavya is an organic product derived from five products evolving from cow and it has been used in India medicine since time immemorial. The present form of panchagavya is a single organic input, Which can act as a growth promoter and immunity booster.

Panchagavya has got reference in the scripts of Vedas (divine scripts of Indian wisdom) and vrkshayurveda (vrksha means plant and Ayurvdha means health system). The texts on vrkshayurveda as systematization of the practices that the farmers followed at field level, placed in a theoretical frame work and it defined certain plant growth stimulants one that enhanced the biological efficiency of crop plants and quality to fruits and vegetables.(Natarajan,2002).

The three direct constituents are cow dung, urine and milk ; the two derived products are curd and ghee. The Sanskrit word panchagavya means ‘’mixture of five products’’ and it has beem used in traditional Indian rituals throughout history. It is also called cowpathy treatment based on products obtained from cows used in Ayurvedic medicine and of religious significance for Hindus. (Savita Jandaik & Visharma 2016).

Panchagavya, an organic product has the role of promoting growth and providing immunity in plant system and panchagavya is also used as fertilizers and pesticides in agricultural operations (*Galinodo et al., 2007*). It is used as a foliar spray, soil application along with irrigation as well as well as seed treatment (Nataraj, 2002). Formers in south India practice panchagavya for sustainable agriculture.

The use of organic liquid such as panchagavya results in higher growth, yield and quality of crop. Usually the management the pest’s insecticide oriented, but the problems associated with synthetic chemicals viz., development of pest resistance objectionable pesticide residue and higher cost etc, has necessitated development of new control methods several plants and its product are known to be potential resources. The present study leaf extracts of different plant were associated with panchagavya,(*K.M.Choudhary et al., 2013*).

Cow’s urine was compared to the nectar. In substrata several medicinal properties of cow’s urine have been mentioned and are known to cause weight loss, reversal of certain cardiac and kidney problems, indigestion, stomach ache, edema, etc, Cow urine has a unique place in Ayurvedha and has been described in itasushirta such and Astanga sangraha to be most effective substances secretion of animal origin with enumerable therapeutic values. It has been recognized as water of life or Amrita (beverages of immortality) the nectar of the God. In India drinking of cow urine has been practiced for thousands of years. Panchagavya is a term used in Ayurvedha to describe five important substances obtained from cow namely urine, dung, milk ghee and curd. In this study chilli plant was chosen as an experimental plant which was treated with panchagavya and panchagavya as the only source of manure, fertilizer as well as pesticide and the results were pretty encouraging.(*Mudiganti Ram Krishna Rao et al., 2015*).

Chilli (*Capsicum annuum L.*) is an important spice cum vegetable crop cultivated extensively in India. The total production of chilli in India in 2013 – 2014 was 1.15 million tons, whereas it is expected to be 1.30 million tons in 2014 – 2015. Thus our country is one of the major players in the world chilli market. Keeping the high export potential chilli production has to be increased by a combination of high yielding plant types, Standard agronomic practices and balanced plant nutrition attained through *Integrated Nutrient Management* (INM). To maintain soil fertility and crop productivity all potential must be used. Green revolution had lead to

intensified agriculture to meet the ever increasing demand for food and fibre. Chilli is an indispensable condiment of every home in India. It is used in the daily diet in one form or the other. It is a rich source of vitamin A and C with good medicinal properties. Chilli contains an alkaloid ‘’Capsaicinoid’’ due to which it has the pungent taste. Heavy use of chemical fertilizers in chilli is also causing environmental pollution. The increase in crop productivity is due to their combined and synergistic effects that help to improve chemical, physical and biological properties of soil and consequently, the soil organic matter and nutrient status.

METERIALS AND METHODS

Traditional Panchagavya:

Panchagavya consists of nine products viz. cow dung, cow urine, milk, curd, jaggery, ghee, banana, Tender coconut and water.

Method of preparation:

In a wide mouthed mud vessel 5 kg of Cow dung and 500 gm of Cow ghee were mixed thoroughly and kept it for 3 days. After 3 days the following ingredients are added and kept it for 19 days with regular mixing both in morning and evening hours daily. On the 20th day 20 liters panchagavya is ready for use. The container was always kept covered with a mosquito net or cotton cloth.

Protocol for Panchagavya Preparation:

- Mix thoroughly fresh cow dung (5kg) + Cow ghee (1/2 kg)
- Incubate for 2 days
- Add Cow urine (3 lit) + 10 lit of water
- Stir properly (morning and evening, daily for 1 week)
- Add Sugarcane juice (3 lit)
- Add Cow milk (2 lit)
- Add Cow curd (2 lit)
- Add coconut water (3lit)
- Add yeast 100 gram and 12 ripened bananas
- The whole mixture is to be incubated for two weeks and the preparation should be filtered through double layered muslin cloth and stored in bottle under refrigerator and used as and when required.

RESULTS AND DISCUSSION

PHYSICO-CHEMICAL CHARACTERIZATION OF PANCHAGAVYA

PHYSICAL PARAMETERS

pH

Physico- chemical analysis of panchagavya sample displayed considerable reduction in pH. Adding panchagavya casts to soil can improve greatly its structure and fertility. Casts usually have a higher pH i.e. neutral pH and more nutrients in the form of total and nitrate nitrogen, organic matter, total and exchangeable magnesium, available phosphorus. Lunt and Jacobson, 1944 reported that worm casts had lower pH than adjacent soil. Jeuniaux 1969 found that the regulation of hydrogen ion inside the gut is between 6.5 and 7.5-8.0, and is has been reported in the mid intestine and about a neutral pH at the rectum. The pH of the panchagavya 7.4 is suitable for further bacteriological degradation (*Padma et al., 2002*).

The reduction in the pH is due to the production of Co_2 and organic acids b microbial activity during the process of bioconversion of the different substrates in the beds (*Sunitha 2012: Manivannan et al., 2012).* Similar results observed by Gunadi and Edwards (2003). The minimum PH of 7.0+0.03 was observed in panchagavya applied pot and the maximum was 7.5+2.02 in control pot (*Tharmaraj et al., 2011*).

ELECTRICAL CONDUCTIVITY

The increased level of electrical conductivity in panchagavya when compared worm casts then the soil. *Balamurugan et al.,* (1999) have also obtained similar result with press mud composted. It has been reported that addition of easily decomposable organic matter would cause rapid decrease in EC and accumulation of carbon dioxide resulting in the release of a large amount of ions into soil leading to an increased electrical conductivity. The observed EC of the present study was in agreement with the reports of *Balamurugan et al.,1999.*

The electrical conductivity of panchagavya depends on the raw materials used for panchagavya and their ion concentration (*Tharmaraj et al., 2011*).The EC of panchagavya increased slightly which may be due to the degradation of organic matter to release cations. Gradual increase in Ec Was recorded in all the feed substrates under decomposition (*Garg et al., 2006).*

Bulk density and Total dissolved solids

The total dissolved solids were increased due to bio degradation of organic wastes by panchagavya. *Nobel et al., 1970* reported that the mat development was found to be inversely. As the mat tends to disappear, soil bulk density gets reduced and the carbon/nitrogen ratio of the surface soil gets increased. Biological conditioning of wastes through panchagavya might be a boon to developing in the utilization of organic wastes for use in organic pollution abatement by rapid reduction in wastes bulk density and elimination of fowl odours (Abbasi 1998). Lal, 2001 Reported that improve total and macro porosity, decreases soil bilk density and improves soil aggregation.

CHEMICAL PARAMETERS

Organic Carbon

The maintenance of higher levels of organic matter and organic carbon in the panchagavya represents an important source of organic matter for carbon depleted soil organic matter encourages the formation of topsoil

and soil aggregates in the surface soil horizon. So it can be concluded that organic matter and organic carbon in the panchagavya form the main source of energy both for soil organisms and plants as well they are helpful in the formation of topsoil and soil aggregates.

Nitrogen

Total nitrogen increased in all the experiments. Nitrogen is the key – nutrient substance for plants and animals as well as microorganisms. When soil organic matter is decomposed, nitrogen is released as the usable nutrient ion, ammonium. Originally ammonium was known as the only mineral form was named as mineralization. This release of nitrogen from was named as mineralization. This release of nitrogen from organic matter decomposition is a major source of usable nitrogen. It is well established that panchagavya modify the spatial distribution of soil organic matter in the soil profile, alter its turnover and accelerate on soil microbial population and activity (*Allen et al., 1998*).

Phosphorus

In the present study the phosphorus level increased in the panchagavya treated incorporated waste when compared with the initial and control. The initial and final phosphorus concentration over control in all the experiments. The uptake of bacteria and fungi followed by grazing microorganisms by the decomposition might result in release of phosphorus compounds that can be cycled through plants and back again to the soil biota as observed by Coleman et al., 1983. Similar results were reported by *Mansell et al., 1981*.

Potassium

Potassium is the third most used elements by plants. Acid production during organic matter decomposition by the microorganisms is the major mechanism for solubilisation of insoluble phosphorus and potassium. The initial and final of potassium in different concentration of revealed that potassium increased progressively more than the control. The present investigation mineralization of K was more in panchagavya, which indicates the role of microorganisms in mineralization process as described by Suthar, 2010.

Calcium

In the present study calcium was found to increase over the initial value. They also found that the excess of calcium gets excreted in concretions formed in the calciferous glands. The similar pattern of calcium enhancement is well documented in available literature (*Garg et al., 2006).*

Micronutrients

Anderson and Laursen, 1982 observed the excretion of Zine, Manganese and Iron through the calciferous glands in L.terrestris, Which coincided with the present study in different concentrations of wastes. The difference of micronutrients in the panchagavya may be due to the combined effect of microorganisms. (*Nagavallemma, et al., 2006*).The physiochemical properties of panchagavya listed in Table -4 is in the agreement with the work done by *Ismail (2005) and Lalitha et al.,(2000).* The C: N ratio was reduced by process of panchagavya. This is indicative of completion of composting process. The micronutrients are available in significant quantity (kala, 1998 and Ismail,2005}.

Bio-fertilizers (panchagavya) contribute macronutrients and micronutrients in amount that is required by plants. According to *Lalitha et al., (2000*), applications of organic fertilizer have an emphatic effect on plant growth and production. Panchagavya, is rich in nutrients and plant growth hormones (Ismail, 1997; Ansari and Sukhraj, 2010; Gorakh Nath and Keshav Singh, 2011).

Table: 1 Physico-Chemical parameters of Panchagavya

PARAMETERS	CONTROL	TREATMENT
pH	7.28±0.01	7.29±0.02
Electrical conductivity(dsm¯1)	4.5±0.12	4.4±0.02
Total Soluble Solids%	25±2.11	27±2.12
Organic Carbon	38±1.15	72.3±1.72
Nitrogen	1110±1.15	1085±2.30
Phosphorus	106.4±1.35	217.2±1.62
Potassium	690±1.13	605.6±3.51
Calcium	632±1.12	756±1.15
Magnesium	205±1.15	255±1.53
Sulphur	252±0.68	255±1.15

Table – 2 : Plant growth parameters of *Capsicum annuum*

S.NO	Treatments	Germination of Capsicum annuum				
		1st day	3rd day	5th day	7th day	10th day
1	Control	-	6	9	10	15
2	Treatment	-	8	9	11	12

Table – 3 : 10th days Plant growth parameters of *Capsicum annuum*

Treatments	Shoot Length (cm)	Root Length (cm)	No. of leaves
Control	3.55±1.12	5.65±1.78	2.69±0.85
Treatment	11.60±1.91	6.40±2.02	5.77±1.82

Table – 4 : 20 days Plant growth parameters of *Capsicum annuum*

Treatments	Shoot Length (cm)	Root Length (cm)	No. of leaves
Control	4.52±1.43	1.88±0.59	3.46±1.09
Treatment	4.67±1.47	7.21±2.28	7.11±2.25

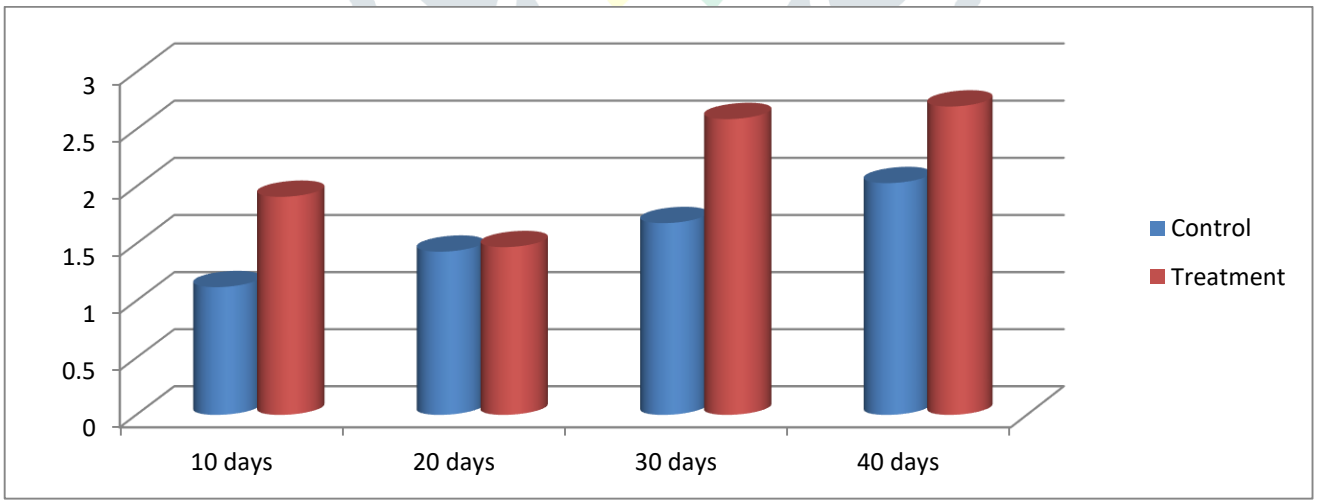
Table – 5 : 30 days Plant growth parameters of *Capsicum annuum*

Treatments	Shoot Length (cm)	Root Length (cm)	No. of leaves
Control	5.32±1.68	1.88±0.59	5.49±1.64
Treatment	4.67±1.47	2.42±0.76	8.66±2.79

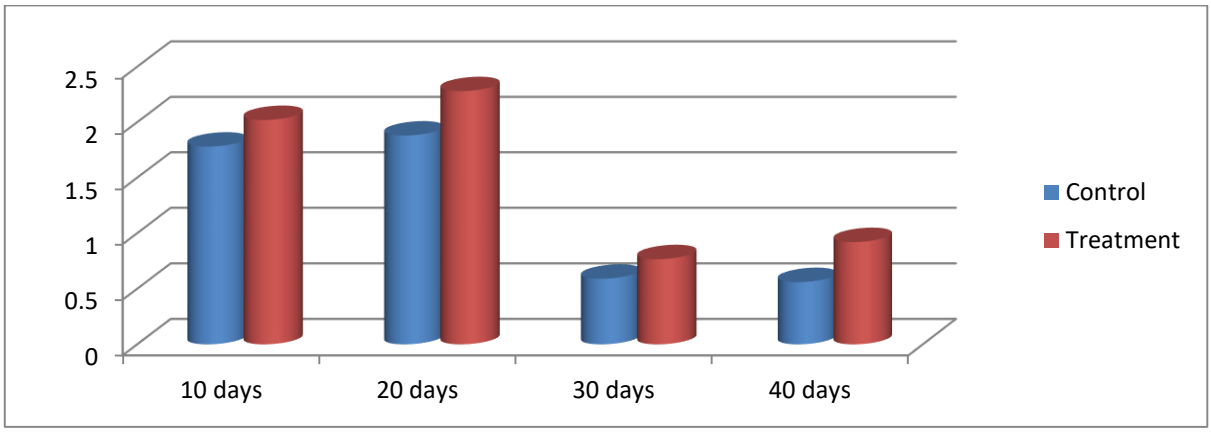
Table – 6 : 40 days Plant growth parameters of *Capsicum annuum*

Treatments	Shoot Length	Root Length	No. of leaves	No. of Branch	No. of Flowers
Control	6.42±2.03	1.78±0.56	6.54±2.06	1.73±0.54	2.49±0.78
Treatment	8.56±2.70	2.92±0.92	10.39±3.28	2.88±0.91	4.04±1.27

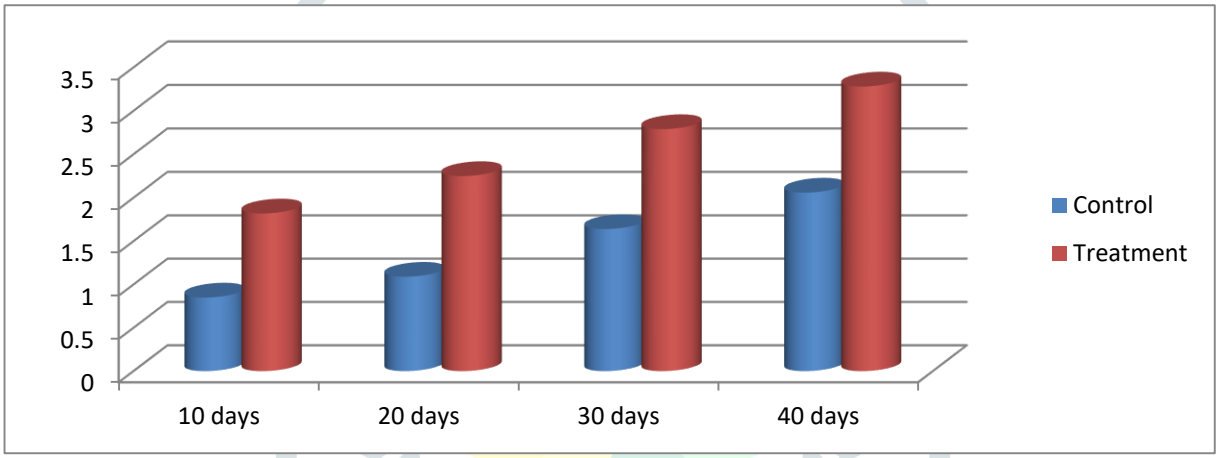
Shoot length of *Capsicum annuum*



Root length of *Capsicum annuum*



No of leaves in *Capsicum annuum*



REFERENCES:

- Abbasi, S.A. 1998. Weeds of despair, and hope.In: We lands of India. New Delhi: Discovery publishing House, 12-21. Seffect in crop yield and soil health. J Crop weed 7(2):84-86.
- Amalraj ELD, Kumar GP, Ahmed SMH, ABDUL R and Kishore N (2013) Microbiological analysis of panchagavya and their effect on plant growth promotion of pigeon pea (*Cajanus cajan L.*) in India. Organic agriculture3(1):23-29.
- Ansari. A.A.2008. Effect of panchagavya on the productivity of potato (*Salanum tuberosum*) and Turnip (*Brassica campestris*), World Journal of Agricultural sciences.4(3) 333-336.
- Ali.M.N.,S Ghata and T.Ragul (2011). Biochemical analysis of panchagavya and their effect in crop yield and soil health. Journal of crop and weed 7(2); 84-86.
- Choudhary, Manish M. Patel and R. D. Pagar 2014. Effect of foliar application of panchagavya and leaf extracts of endemic plants on ground nut (*Arachis hypogel L.P)* Legume Res, 37 (2); 223-226.
- Galindo, A.,C. Jeronimo, E. Spaans and M.Weli, 2007. An introduction to morden agriculture. Tierra Trop., 3: 91-96.
- Geetha and Devaraj, 2013. Effect of microbial fertication and panchagavya on the growth of Vitis Vinifera gragtings.In. J. Biosci Res.,(2):1-6.
- Geetha S and Aruna D (2013). Effect of microbial fertication and panchagavya on the growth of Vitis Vinifera graftings. Int. J Bioscience Res.2:1-6.

- Gorak wath, and kesav singh, 2011. Effect of foliar spray of Bio pesticides and kitchen waste on soybean *(Glycine max L.)* crop. Botany Research International 4(3):25-27
- Govindarajan. B and V. prabakaran, 2012. Antibacterial Activity of panchagavya. Int. J. Biological Technology. 3(3):15-16.
- Natarajan, 2002. Panchagavya – Amanual. Other India press, Mapusa, Goa, India. P-33
- Padma U. Rao.S and Srinivas . 2002. Eco-friendly of vegetable waste through panchagavya. Journal of Ecology. 14(2). 155-159.
- Rejesj. M and Jeyakumar, 2013. Changes in Morphological, Biochemical and yield parameters of *Abelmoschus esculents* (L.) Moench due to panchagavya spray. International Journal of Modern plant and Animal Sciences 1(2): 82-95.
- Rashmi, K. R. Earanna, N and M. Vasundhara, 2008. Influence of biofertilizers on growth, biomass and biochemical constituents of *Ocimum gratissimum.L.* Biomed 3(2);123-130,144
- Savaita Jandik and vishakha Sharma, 2016. International Invention Journal of Agricultural and soil science. 4(2).pp.22-26.
- Singh. J. B., Sreekrishna, B and Sudarshan, M.R. (1997). Performance of scotch bonnet chilli in Karnataka and its response to panchagavya. Indian Cocoa, Arecant and spices. Journal.21;9-10
- Sivakumar, 2014. Review of panchagavya. Int. J. Adv. Rec. Biosci.1 (8); 132-154.
- Tharmaraj. K, Ganesh.P, Sureshkumar. R. Anandan. A, Kolanginathan. K (2011). A Critical Review on panchagavya – A Boon plant Growth. Int. J. Pharm. Biol. Arch.2(6);1611-1614
- Ushakumari. K. praphakumari.p and p.Padmaja, 1999. Efficiency of panchagavya on growth and yield of summer crop okra (*Abelmoschus esculentus moench*). Journal of Tropica agriculture. 37:87-88.
- Vallimayil and sekar. R (2012). Investgation on the effect of panchagavya on sounthern sunhemp mosaic virus (SSMV) infected plant ststems. J. Environ.Res.6(2):75-79.