Journal of Pharmacognosy and Phytochemistry
Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2020; SP6: 80-82

Dr. AD Ashok
Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Trichy

J Ravivarman
Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Trichy

Dr. K Kayalvizh
Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Trichy

Correspondence
Dr. AD Ashok
Institute of Agriculture, Tamil Nadu Agricultural University, Kumulur, Trichy

International Web-Conference
On
New Trends in Agriculture, Environmental & Biological Sciences for Inclusive Development
(21-22 June, 2020)

Review on the effect of Panchagvya, PPFM and Humic acid on Greens Biomass

Dr. AD Ashok, J Ravivarman and Dr. K Kayalvizh

Abstract
The organic inputs have played a decisive role in modifying different plant characters. Organics like Panchakavya and PPFM have been widely used for improving quality and yield in different horticultural crops. Panchagavya, methylobacteria and humic acid are improving the growth of green vegetables particularly amaranthus a major green cultivated in India. Above mentioned organics have effect on plants growth by improving nutritional status of plants. The effect of some organics on growth and development of plants is reviewed here.

Keywords: Organic inputs, Amaranthus, Greens, biomass, dry matter

Introduction
The organic inputs have played a decisive role in modifying different plant characters. Organics like Panchakavya and PPFM have been widely used for improving quality and yield in different horticultural crops. The effect of some organics on growth and development of plants is reviewed here.

Botanical description of Amaranthus
Annual, erect or decumbent herbs; leaves alternate, narrowed to the base, entire or lobbed. Flowers small, monoecious, in axillary clusters or dense, terminal panicles; bracts herbaceous, often persistent; bracteoles 2. Male flower- perianth of 5, rarely 1- 3 membranous equal or nearly equal, ovate, lanceolate segments. Stamens 5, rarely 1- 3; filaments free, subulate or filiform; anthers oblong or linear, 2- celled. Female perianth- segments oblong or spathulate, in fruit erect, sometimes coriaceous and usually persistent. Carpels forming an ovoid, compressed, 1-celled ovary; ovule solitary, subsessile, erect, style short or 0; stigma 2-3, subulate or filiform, hirsute or papillose. Fruit an orbicular or ovoid, compressed utricle, or a circumscissile, membranous or coriaceous capsule, with entire or 2-3 toothed apex. Seed erect, orbicular, compressed; testa crustaceous; embryo annular, enclosing the floury albumen, cotyledons linear; radical inferior (Prain, 2004) [1].
Amaranthussp belongs to the family Amaranthaceae, which consists of about 65 genera and 900 species (Robertson, 1981) [2]. Amaranthus is a genus of wide global distribution, and members of the genus can be found in tropical and temperate regions all over the world. The genus contains about 75 wild, weedy and domesticated species (Sauer, 1993) [3].
A survey of the literature, undertaken in connection with a study of the karyotypes of the dioecious species of Amaranthus (Grant, 1959) [4], revealed that very few chromosome numbers determination had been made in the genus and that certain discrepancies existed (Darlington and Wylie, 1955) [5]. On the basis of the karyotypic analysis Sharma and Banik (1965) [6] have discussed interrelationships in family Amaranthaceae. All these Indian workers have reported n=17 in all the species of *Amaranthus* L. without variations.
Most amaranth species are C4 plants. They generally use the Calvin cycle or C4 pathways. But in some cases modification occurs in normal C4 photosynthesis which carries the specialized C4 pathway. There are several workers who have done on both C4 and C3 pathways by accumulating the data on chloroplast and carbohydrate (National Research Council, 1984) [7].

Effect of panchagavya on plants

Plant growth substrates present in Panchakavya treated soil help to bring rapid changes in phenotypes of plants and also improves the growth and ultimately improves the productivity of Spinach (Kumar *et al*., 2014) [8].

A field experiment was conducted to find the variation in biochemical, growth, and yield parameters of *Abelmoschus esculentus* under different concentrations (Control, 1%, 3%, 5% and 7%) of panchagavya, and physic-chemical and biochemical properties were increased in 3% concentration. Since there was increase in growth and yield parameters at low concentration of panchagavya, it is recommended that the panchagavya can be used for spray after diluted properly to 3%.

Sailaja *et.al*., (2014) [9] recorded that there is an increase in biomass (301%), shoot length (88.53 %) and root length (71.03 %) in panchagavya treated spinach plants (*Spinacia oleracea*) over control.

Swaminathan *et al.* (2007) [10] and Natarjan (2002) [11] stated that few farmers in the southern parts of India have used modified formulations of Panchagavya and found them to enhance the biological efficiency of the crop plants and the quality of fruits and vegetables.

Panchakavya is obtained from five major cowproducts.These substances play the role of promoting of growth & providing immunity in plant system. Panchakavya also contains macro & micro – nutrients (Gowthami *et al.*, 2014) [12]

Effect of PPFM on plants

Methylobacterium spp. are a group of bacteria known as Pink Pigmented Facultative Methylotrophs or PPFMs, strict aerobic gram negative rods, able to grow on C_1 compounds such as methanol, formate, formaldehyde, and methylamine as well as on a variety of C_2, C_3 and C_4 compounds (Lidstrom, 2001) [13].

Evidence for the role of phytohormone synthesis of auxin, cytokinin and ACC deaminase (Madhaiyan *et al.*, 2006) [14] by *Methylobacterium* sp. and its plant growth promoting activity from the studies of Holland (1997) [15] showed this genera can be exploited for its endophytic association and diazotrophic property (Sy *et al.*, 2001) [16].

Basile *et al.* (1969) [17] first demonstrated the growth enhancing effects of PPFMs on plants in a tissue culture system where they produced vitamin B_{12} and stimulated the growth of a liverwort, *Scapania nemorosa*. Interestingly PPFMs were also reported to produce growth hormones *viz*, cytokinins (zeatin, *trans*-zeatin and *trans*-zeatin riboside) (Koenig *et al.*, 2002) [18]. and auxins (indole-3- acetic acid, indole-3- pyruvic acid and indole-3- butyric acid) (Ivanova *et al.*, 2001 [18]; Omer *et al.*, 2004 [20]). They have also been shown to stimulate seed germination and plant growth (Corpe and Basile, 1982) [21].

The seedling weight and shoot length of *Nicotiana tabacum*, *Lycopersicon esculentum*, *Sinapis alba*, and *Fragaria vesca* increased significantly in the presence of the pink-pigmented facultative methylotroph (PPFM) strain *Methylobacterium extorquens* ME4 (Abanda., 2006) [22].

Effect of Humic acid on plants

Humic acids are heterogeneous, which include in the same macromolecule, hydrophilic acidic functional groups and hydrophobic groups. Humic acid hydrophilic groups attract hydration, thus increasing the water retention capacity in soils (Stevenson, 1994) [23].

Humic acids have been shown to stimulate plant growth and consequently yield by acting on mechanisms involved in: cell respiration, photosynthesis, protein synthesis, water and nutrient uptake, enzyme activities (Chen, 2004) [24].

Humic substances have a very strong influence on the growth of plant roots. When humic and fulvic acids are applied on the soil, enhancement of root initiation and increased root growth may be observed (Pettit, 2004) [25].

Duplessis and Mackenzie (1983) [26] found that the grain yield of legumes, such as mung bean (mash bean=moong) (*Vigna radiate* L.), soybean (*Glycine max* L.) and pea (*Pisumsativum* L.) (Iswaran, 1980), increased by the use of these humic substances.

In Spinach, addition of 1280 mg/l of Humic acid produced significant increases in shoot accumulation of P, K, Ca, Mg, Fe, Mn & Zn as well as accumulation N, Ca, Fe, Zn & Cu in roots. Fresh & dry weight were also increased (David *et al*., 1991) [27].

Conclusion

On concluding the review, we can sure to utilize organics like panchagavya, methylobacteria and humic acid for improving the growth of green vegetables particularly amaranthus a major green cultivated in India. Above mentioned organics have effect on plants growth by improving nutritional status of plants.

References

1. Prain D. Bengal Plants. Bishen singh Mahendra Pal singh, Dehradun, India. 2004; 2:868.
2. Robertson KR. The genera of Amaranthaceae in the Southeastern United States. Journal of the Arnold Arboretum. 1981; 62:267-313.
3. Sauer JD. The grain amaranths: A survey of their history and classification. Annual Missouri Botanical Garden. 1950; 37:561-619.
4. Grant WF. Cytogenetic studies in Amaranthus. I Cytological aspects of sex determination in dioecious species. Canadian Journal of Botany. 1959; 37:413-417.
5. Darlington CD, Wylie AP. Chromosome Atlas of Flowering Plants. George Allen and Unwin Ltd., London, 1955.
6. Sharma AK, Banik M. Cytological investigation of different genera of Amaranthaceae with a view to trace their relationships. Journal of the Botanical Society of Bengal. 1965; 19(1):40-50.
7. National Research Council (NRC). Amaranth modern prospects for an ancient crop. Natl. Academy press. Washington, D.C. 1984.
8. Kumar D, Kanderi V, Sailaja N, Ragini, Reddy, Bontha, Swamy S, Vyshnava. Effect of foliar application of panchagavya on growth and development of leafy vegetable. International Journal of Agricultural and Food Science. 2014; 4:119-122.
9. Shailaja B, Mishra I, Gampala S, Singh VJ, Swathi K. Panchagavya- an ecofriendly insecticide and organic growth promoter of plants Int. J of Adv. Res. 2014, 2.
10. Swaminathan C, Swaminathan V, Vijayalakshmi V. Panchagavya Boon to Organic Farming. International Book Distributing Co., India, 2007.
11. Natarajan K. Panchagavya A Manual. Other Indian Press, Mapusa, Goa, India. 2002, 33.
12. Gowthami R. Panchagavya in Organic Crop Production. Popular KHETI. 2014; 2:233-236.
13. Lidstrom ME. The aerobic methylotrophic bacteria. In: Dworkin, M. (eds.), The Prokaryotes. Springer, Berlin,

Heidelberg, New York, Tokyo, 2001, 223-244.
14. Madhaiyan M, Poonguzhali S, Senthilkumar M, Sundaram SP, Sa TM. Characterization of *Methylobacterium* spp. as root-nodule symbionts of tropical legumes. Microbiol Res (inpress), 2006.
15. Holland MA. Occams razor applied to hormonology. Are cytokinins produced by plants? Plant Physiol. 1997; 115:865-868.
16. Sy A, Girud E, Jourand P, Garcia N, Willems A, DeLajudie P *et al*. Methylotrophic *Methylobacterium* bacteria nodulate and fix atmospheric nitrogen in symbiosis with legumes. J Bacteriol. 2001; 183:214-220.
17. Basile DV, Slade LL, Corpe WA. An association between a bacterium and a liverwort, *Scapania nemorosa.*Bull. Torrey Bot. Club. 1969; 96:6711-6714.
18. Koenig RL, Morris RO, Polacco JC. tRNA is the source of low-level *trans*-Zeatin production in *Methylobacterium* spp. J Bacteriol. 2002; 184:1832-1842.
19. Ivanova EG, Doronina NV, Trotsenko YA. Aerobic methylobacteria are capable of synthesizing auxins. Microbiology. 2001; 70:392-397.
20. Omer ZS, Tombolini R, Broberg A, Gerhardson B. Indole-3-acetic acid production by pink-pigmented facultative methylotrophic bacteria. Plant Growth Regul. 2004; 43:93-96.
21. Corpe WA, Basile DV. Methanol-utilizing bacteria associated with green plants. Dev. Indust. Microbiol. 1982; 23:483-493.
22. Abanda ND, Musch M, Tschiersch J, Boettner M, Schwab W. Molecular interaction between *Methylobacterium extorquens* and seedlings: growth promotion, methanol emission site. J Exp. Bot. 2006; 57(15):4025-4032.
23. Stevenson FJ. Humus Chemistry: Genesis, Composition, Reactions. John Wiley & Sons. 1994, 285.
24. Chen Y, De Nobili M, Aviad T. Stimulatory effects of humic substances on plant growth. In: Soil organic matter in sustainable agriculture (Magdoff F., Weil R.R., eds). CRC Press, NY, USA. 2004, 103-129.
25. Pettit RE. Organic matter, humus, humate, humic acid, fulvic acid and humin: Their importance in soil fertility and plant health, 2004.
26. Duplessis GL, Mackenzie AF. Effects of leonardite applications on phosphorus availability and corn growth. Canadian Journal Scientific. 1983; 57:749-751.
27. David PP. Effects of applied humic acids on yield, growth, nutrient accumulation content in selected vegetable crops and soil interactions that reduce their effectiveness. Dissertation Abstracts International B. Sciences and Engineering. 1991; 52(3):1136B-1137B.