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Investigation on the Effect of Panchagavya on Sounthern Sunnhemp Mosaic Virus (SSMV) Infected Plant Systems

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Abstract: Panchagavya is an organic product blended from five different cow products, commonly applied to crop plants in organic farming. It is used as foliar spray, soil application and seed treatment. It can act as growth promoter and immunity booster. Effects of application of panchagavya in the form of seed treatment and foliar spray to Southern Sunnhemp Mosaic Virus infected sunnhemp plants were studied. Growth and biochemical parameters studied showed better growth in panchagavya treated plants. Various concentrations from virus infected plants were tested on cluster bean a local lesion assay host for this virus. Panchagavya treated plants showed lesser viral intensity than control. The effect of foliar spray of panchagavya on virus concentration in the local lession host also studied, by inoculating the plants with virus of different time intervals after foliar spray. A significant change in viral concentration was observed.

Key words: Panchagavya · Sunnhemp · Cluster bean

INTRODUCTION

Green revolution had lead to intensified agriculture to meet the ever increasing demand for food and fiber, which is a practice at great cost to the environmental resulting in continuous loss of natural ecosystems, ground water, food stuff pollution and other environmental degradation [1]. The indiscriminate use of chemical pesticides in modern agriculture resulted in the development of several problems such as pesticide resistance insects, resurgence of target and non target pests, destruction of beneficial organisms like honey bees, pollinators, parasitoids and predators and pesticide residue in food, feed and fodder. The awareness about the health and environmental problems due to the continuous use of pesticides resulted in the development of integrated pest management (IPM) and organic farming [2, 3].

Organic farming has developed very rapidly in recent years. Indian agriculture has a better chance to convert itself as organic agriculture because, the per capita and per ha consumption of chemical fertilizer and pesticides in the country is much lower than the global standards. In olden days cattle based agriculture was widely practiced. Cow is greatly respected, worshipped. The cow is an inseparable part of the farming community. We are directly benefited from cow in terms of milk production, dung and urine production as well as in terms of milk products like curd, butter and ghee.

Panchagavya, a Vedic formulation of the five products of cow is used as a foliar application to boost yield of crop plants and to restrict the incidence of common diseases. This traditional Panchagavya formulation is now being used by some farmers in organic farming with some modifications. Few farmers in the Sounthern 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 [4]. Panchagavya contains growth regulatory substances such as IAA, GA, Cytokinin, Essential plant nutrients, effective microorganisms like lactic acid bacterium, Yeast and *Actinomycetes.* It also contains biofertilizers like *Acetobactor, Azosprillum* and Phosphobacterium and plant protection substances [5]. Sunnhemp (*Crotalaria juncea* L.) a green manure crop belongs to the family leguminosae. It is used in agriculture as green manure crop to increase yield. Varieties of

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Sunnhemp are raised in many states as fiber and as green manure crop. This plant found infected with a virus causing mosaic disease. During severity of disease, plants showed puckering and curling [6]. The virus was named as Sounthern Sunn Hemp Mosaic disease (SSMV). The virus is serologically related to TMV and ss^{+ve} strand RNA virus [7]. The virus is readily transmitted by mechanical inoculation [8, 9]. In the present work an attempt was made to find out the effect of panchagavya on Sounthern Sunnhemp Mosaic Virus (SSMV) infected plant systems. As there was no report pertaining to the effect of panchgavya on virus-infected plants, this work was carried out.

MATERIALS AND METHODS

Host Plants: Sunnhemp (*Crotalaria juncea* L.) is an important green manure crop in India. It is used in the agriculture to increase the yield in many vegetable crops. Varieties of Sunnhemp are raised as fiber and as green manure crop in India. This plant was used as a systemic host. Cluster bean (*Cyamopsis tetragonoloba* L.) was used as a virus assay host (Local lesion host).

Maintenance of Sunnhemp and Cluster Bean Plants: The garden soil was filled in mud pots. Healthy seeds of Sunnhemp and cluster bean plants were surface sterilized with 0.1% mercuric chloride and shown. Four days after germination plants were thinned down to 10-12 uniform seedlings per pot.

Viral Inoculation: Virus Inoculum of SSMV (Sounthern Sunnhemp Mosaic Virus) was obtained from department of Botany, Thiagarajar College, Madurai. One gram of viral infected sunnhemp leaf tissue was grounded in 0.1M phosphate buffer pH 7.0 (1gm/ml) using a mortar and pestle. The sap was strained through a muslin cloth. "Celite503" (7.5mg) was added as an abrasive.

Seven days old seedlings of sunnhemp plants were used for inoculation, it was carried out by rubbing the cotyledonary leaves with fore finger previously dipped in the inoculum. The rubbing direction was from the base of the leaf of the tip. Rubbing was done carefully with a uniform force over the entire leaf lamina. After each inoculation, the excess inoculums were washed off with distilled water [10, 11].

Preparation of Panchagavya: Panchagavya was prepared as described by Natarajan [4]. Surface sterilized sunnhemp seeds were soaked in 3% panchagavya for 2 hours and sowed in pots containing sterilized soil. Pots were maintained in insect proof cage. Seven days after germination seedlings were inoculated with SSMV inoculum prepared by grinding SSMV infected Sunnhemp leaves in 0.1M phosphate buffer pH 7.0 (1gm/ml) and squeezed through cheese cloth. Appropriate controls were maintained. The plants were sprayed with 3% panchagavya on every 15 days. Forty-five days after germination, plants were uprooted and different parameters were studied.

Growth Parameters: Shoot, root length, number of nodules and number of leaves, total fresh and dry weights were recorded.

Biochemical Parameters: The following biochemical parameters were carried out in this present study. Estimation of photosynthesis pigments, estimation of carotenoids, estimation of protein synthesis and reducing sugars.

Assay of SSMV Virus: Infected leaves were collected from panchagavya treated and control plants at random and sap was prepared separately as described above and inoculated on cotyledonary leaves of 7-day-old local lesion host, cluster bean plants (*Cyamopsis tetragonoloba*). After 72 hrs the lesions were counted.

Panchagavya Treatment on SSMV Infected Cluster Plants: In this experiment 3% panchagavya was sprayed on 7 days old assay host, cluster bean. After spraying different sets of plants (10 nos each) were inoculated with SSMV inoculum at different time intervals (0, 2, 4, 6,….12 hrs). After 72 hrs local lesions were counted. The percentage of virus inhibition was calculated by using the formula A-B/Ax100, where A is the number of lesions in control and B number of lesions in panchagavya treated plants [12]. The results were analyzed statistically.

RESULTS

Foliar application of the panchagavya showing better result in SSMV affected plants. This work was carried out to find the effect of panchagavya on a virus-infected plant. Both panchagavya treated and control plants inoculated with SSMV showed mosaic symptom after 10 days. Panchagavya treated plants showed better growth than water treated control plants.

Effect of Panchagavya on Growth of Plants: After forty days both water treated and panchagavya treated plants were uprooted carefully and parameters like shoot, root

Table 1: Table shows that growth parameters of control and SSMV infected Sunnhemp plants

Treatments sprayed with	Shoot length (cm)	Root length (cm)	Number of nodules	Number of leaves
Water alone	47.0 ± 0.95	15.4 ± 0.185	5± 0.185	28±0.9938
Water + SSMV inoculated	40.5±0.619	12.3±0.261	2±0.416	25±0.889
Panchagavya alone	58.5±0.144	15.7±0.093	8±0.248	41±0.988
Panchagavya + SSMV inoculated	51.4±0.134	15.5±0.279	7±0.314	36±0.921

Table 2: Table shows that fresh and dry weights of control and SSMV infected Sunnhemp plants.

Treatments sprayed with	Fresh weights	Dry weights
Water alone	7.9±0.276	3.0±0.076
Water+SSMV inoculated	3.8±0.291	1.5±0.071
Panchagavya alone	10.2±0.129	4.2±0.176
Panchagavya + SSMV inoculated	9.77±0.179	3.0±0.142

Table 3: Assay of Panchagavya treated and SSMV inoculated Sunnhemp plants

Control (Water treated)	Panchagavya treated
68*	39 (42.6) ‡

* Average number of lessions

‡ % of inhibition over control

length, number of nodules and number of leaves (Table 1), total fresh and dry weights were recorded (Table 2). Panchagavya treated plants showed better growth than water treated control plants. Shoot and root length increased in panchagavya treated plants compared with control. In the same way panchagavya treated + SSMV inoculated plant showed higher growth than water treated + SSMV inoculated plants. Total number of nodules and leaves increased in panchagavya treated plants than in control plants. Biomass also showed increased trend in panchagavya treated plants than in control.

Effect of Panchagavya on Biochemical Parameters: After forty five days both water treated and panchagavya treated control and SSMV infected Sunnhemp plants were uprooted carefully and biochemical parameters like chlorophyll, carotenoids, soluble sugars and protein contents were estimated as described in materials and methods. Biomass showed increased trend in panchagavya treated plants than in control. Chlorophyll, carotenoid and soluble sugar content increased in panchagavya treated plants than in control (Fig. 1& 2).

Effect of Panchagavya on Concentration of Virus in Cluster Bean (Assay Host): When the water treated + SSMV inoculated and panchagavya treated + SSMV inoculated sunnhemp plant leaves were assayed on cluster bean (assay host), lesser number of lesions was observed in panchagavya treated plants [39] percentage inhibition of virus is 45.6%. This showed that in panchagavya treated plants virus multiplication is reduced than in control (Table 2). Cluster bean plants inoculated with SSMV at different time intervals after panchagavya spraying showed higher inhibition rate 2 hrs

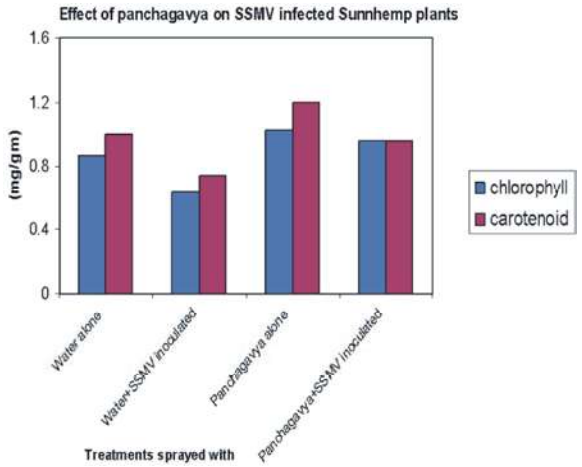

Fig. 1: Biochemical parameters of control and SSMV infected Sunnhemp plants.

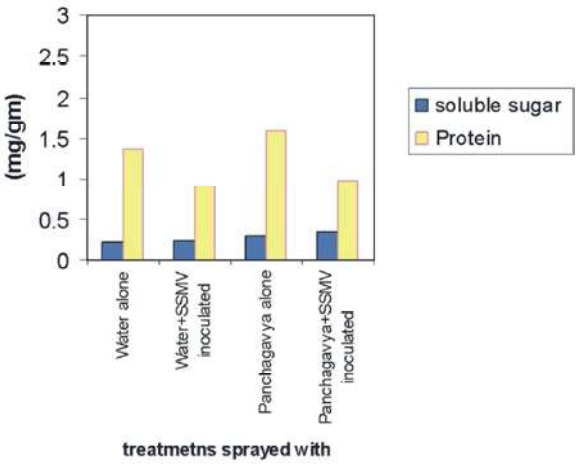

Fig. 2: Biochemical parameters of control and SSMV infected Sunn Hemp plants

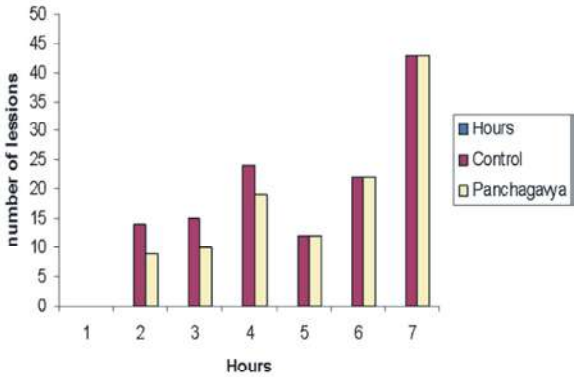

Fig. 3: Local lesion formation in Cluster bean (assay host) plants inoculated with SSMV at different time intervals after treatments with Panchagavya

(35.7%) and 4 hrs (33.3%). In other treatments the rate of inhibition is lesser (16 to 20%). This showed that higher inhibition of virus occurs between 2-4 hrs after spraying with panchagavya (Fig. 3).

DISCUSSION

There is a growing concern over the current agricultural practices in terms of sustainability over long periods since it might causes a gradual decline in factor productivity with adverse impact on soil health and quality [13, 14]. It has been widely accepted that organic farming alone could serve as holistic approach towards achieving sustainable agriculture as it is nature based, environmental friendly and ensure the conservation of resource for the future. Organic farming is quite distinct in the sense that it relies on closed nutrient cycles with less dependence on off-farming inputs. Organic farming has developed very rapidly in recent years. Indian agriculture has a better chance to convert itself as organic agriculture because, the per capita and per ha consumption of chemical fertilizer and pesticides in the country is much lower than the global standards. Panchagavya is an organic input used by the farmers improves the crop yield. Very few farmers using it as an organic farming. The results indicate that panchagavya treated healthy plants and also the panchagavya treated + virus infected showed better growth as the result there was a deduction in virus concentration. Several reports indicate the improvements in growth and biochemistry of plants when sprayed with panchagavya [5, 15-18]. In the present work also panchagavya treated Sunnhemp plants showed better growth and increased pigments and carbohydrate content. It may be due to the presence of growth regulatory substances such as IAA, GA, cytokinin, essential plant nutrients, effective microorganisms and biofertilizers like Acetobacter, Azosprillum and Phosphobacterium in panchagavya [5]. Panchagavya also reported to contain pesticidal and pest repellent activity [4, 17, 19, 20]. Presence of lesser virus concentration in panchagavya + SSMV treated sunnhemp and on assay host cluster showed that spraying with panchagavya improves plant health and act as immunity booster [3]. Nagaraj Naik and Sreenivasa showed that panchagavya contains bacteria producing plant growth promoting substances as well as bacteria having biological detergent activities. Presence of such beneficial microbial biomass resulted in improved seed germination, seedling length and seed vigor in wheat.

From the present study it could be concluded that panchgavya play an important role in organic agricultural development. The present study was highly helpful for development. All the above results clearly indicated that plants were treated with Panchagavya showing higher yield, lesser viral activity when compared to the control, also these SSMV viral activity were tested by using assay host plants at different time intervals. Higher viral inhibition rate was studied in the panchagavya treated plants.

REFERENCES

1. Gupta, A. and M. Gopal, 2001. Microbial control strategies for disease management in context of coconut plantation crop, Biological control of pests,ed.A.a. Desmukh, Pub. By S.A. Desmukh, Karad. Ms. india, pp: 101-122.
2. Thomas, G.V. and S.R. Prabhu, 2001. Bioinoculants and organic amendments for ensuring crop health in sustainable agriculture, in biological control of pests, ed. A. M. Deshmukh, pub.by S.A. desmukh, Karad. Ms. India. pp: 122-162.
3. Prabhu, M.J., 2004. Dasagavya- organic growth promoter for plants. www. Hindu.com/ seta/ 2004/ 02/12.
4. Natarajan, K., 2002. Panchagavya-A manual, Other India Press, Mapusa, Goa, India, pp: 33.
5. Somasundram, E., N. Sankaran and T.M. Thigarajan, 2004. Modified Panchagavya for better yield. www. Hinud.com/ seta/2004/02/12
6. Raychaughuri, S.P., 1947. Current Science, 16: 26-28.
7. Capoor, S.P., 1950. Curr. Sci., 19: 22.
8. Nariani, T.K. and P.Y. Chadrasekar, 1963. Indianphytopathology, 16: 171-173.

9. Chadragiri, K.K. and S. Paneerselvan, 2003. Response of green gram to varied concentrations of Panchagavya (*Organic nutrients*) foliar application, Madras Agricultural Journal, 90: 169-172.
10. Sekar, R., 1991. Studies on cross protection behavior of TMV strains in a local lesion host. Journal of Ecobiol., 31: 28-131.
11. Vairamani, T. and R. Sekar, 1994. Inhibition of Southern Sunnhemp Mosaic virus by Plant Extracts, J. Ecobiol., 6: 37-239.
12. Zaidi, Z.B., *et al*., 1988. Inhibition of spinach mosaic virus by extracts of some medicinal plants, Current. Science, 57: 151-152.
13. Subba Rao, I.V., 1999. Soil and environmental pollution- A threat to sustainable agriculture J. Indian Soc. Soil Sci., 47: 611-633.
14. Stockdale, E., 2000. Agronomic and environmental implications of organic farming systems. dv. Agron., 70: 261-327.
15. Jeyasree, P. and M. George, 2006. Do biodyanamic practices influence yield, quality and economics of cultivation of chilli (*Capsicum annum* L.). Journal of Tropical Agriculture, 44: 68-70.
16. Sangeetha, V. and R. Thevanathan, 2010a. Effect of panchagavya on nitrate assimilation by experimental plants,The journal of American Science, 6: 80-86.
17. Vivekanadan, P., 1999. Panchagavya advances paddy harvest by 10 days. Agri.news, 2: 11-11.
18. Vijalakshmi, K., 2004. Indigenous Agricultural News, 4: 5-6.
19. Belina, E., P.M.M. David and M.A.K. Pillai, 2005. Effect of cow's urine (panchagavya) on brinjal pest *Ephilachna vigintipunctuate* Fab. and *Leucinodes orobonahis* Guen. Madras Agri. J., 92: 358-363.
20. Selvaraj, P., 2004. Panchagavyam organic insect repellent, Nemvazhi Velanmai, 13: 6.