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# Biochemical analysis of *Panchagavya* and *Sanjibani* and their effect in crop yield and soil health

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**ABSTRACT**

*The present research work was conducted in RBD. The experiment was designed with three treatments and three replications, with the view to studying the effect of Panchagavya and Sanjibani, liquid organic manure on the yield of green gram, Vigna radiata, chilli, Capsicum frutescens (Chili) and mustard, Brassica campestris. Their efficacy were compared by studying the yield contributing characters like plant height, primary branch, secondary branch plant$^{-1}$, number of seed fruit$^{-1}$, fruit length, weight of 100 seed, yield plant$^{-1}$, yield m$^{-2}$ and experimental observation recorded that the Sanjibani and Panchagavya treated crops were higher than the control. A liquid manure specifically Sanjibani used in this study was pre-analysed to study the variation in microbial population between two Sanjibani sample prepared by using raw materials (Cow dung and Cow urine) obtained from two different source of cow breed (i.e., Native breed and Jersey breed) and the best source of breed was selected for the further research work. Meanwhile the effect of organic farming practice in soil-health was also studied by analysing the basic parameters of soil in the field were the research was conducted. The result shows increased microbial population, oxidisable organic carbon, nitrogen, phosphate, potash. The pH and E.C were found to be close to neutral.*

**Key words:** Chilli, crop yield, green gram, mustard, *Panchagavya*, *Sanjibani*, soil health

The greatest challenge facing by the nation in the coming years is to provide safe food for the growing population in the country. In this regard, organic farming which is a holistic production management system for promoting and enhancing health of agro-ecosystem, has gained wide recognition as a valid alternative to conventional food products and ensures safe food for human consumption . This farming system avoids largely use of synthetic fertilizers, pesticides, growth regulators and livestock feed additives and relies on green manures, crop rotations, crop residues, animals manures, biofertilizers, bio/botanical pesticides, different kinds of cow based liquid organic manure such as *Panchagavya*, *Sanjibani*, *kunapajala*, *amrit pani*, etc. In Sanskrit, *Panchagavya* means a combination of five products obtained from cow. When suitably mixed and used, these have miraculous effects. *Panchagavya* is used in different forms such as foliar spray, soil application along with irrigation water, seed or seedling treatment etc. For foliar spray 3% concentration is being used by organic farmers (Natarajan, 2002). *Panchagavya* was an important one that enhanced the biological efficiency of crop and the quality of fruits and vegetables production. It also increases the soil fertility (Swaminathan *et al.*, 2007). *Sanjibani* is a preparation having cow dung and cow urine. It helps to improve soil fertility and enhance crop productivity and quality of product and also working as a pest-repellent (Swaminathan *et al.*, 2007). It is very much essential to develop a strong workable and compatible package of nutrient management through organic resources for various crops based on scientific facts, local conditions and economic viability. Thus, the current research work was aimed at studying the biochemical composition of *Panchagavya* and *Sanjibani* and their effect on the yield and yield contributing characters of green gram, chilli and mustard.

## MATERIALS AND METHODS

*Sanjeevani* stock solution was prepared by mixing cow dung (1 kg), cow urine (1 litre) and water (2 litre) and *Panchagavya* was prepared by mixing cow dung (500 gm), cow urine (300 ml), cow milk (200 ml), cow curd (200 ml) and cow ghee (100 ml), both the preparation was kept in a separate plastic container. The mouth of the containers were covered with a thin cloth and kept in the shade. The preparations were then left for incubation (to ferment). During this incubation period the liquid bio-manures were stirred twice a day (morning and evening), 10 times of clock wise and anti-clockwise direction to release the gas and to oxygenate the solution. After nine days of preparation, both the manures were ready for field application.

To study the microbial variation in *Sanjibani*, solutions were prepared by using raw material obtained from the two different cow breeds (Native and Jersey), following the same procedure. The two different *Sanjibani* samples were periodically analysed for variation in microbial population during incubation, until the microbial growth curve attained the decline phase by following the standard serial dilution and plating technique, (Subba Rao, 1999). Total number of colony was counted for all the plates by using colony counter and recorded accordingly. Colony Forming Unit (CFU) for each dilution of all treatments was calculated by using the standard formula CFU = (Total number of colonies/Volume of sample taken) x Dilution factor. Chemical properties

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of liquid manures and soil such as pH, EC, organic carbon, Nitrogen, Phosphate and potash were analysed by following the standard procedure (Singh et al., 1999). A field trial in RBD with replication was conducted to observe the effect of *Panchagavya* and *Sanjibani* on different crops like *Capsicum frutescens*, *Vigna radiata* and *Brassica campestris*.

## RESULTS AND DISCUSSION

Macro-nutrient content in both *Panchagavya* and *Sanjibani* is more or less similar. Organic carbon content is slightly more in *Panchagavya*. *Panchagavya* is slightly acidic in nature but *Sanjibani* is supposed to be neutral. Both *Panchagavya* and *Sanjibani* are slightly saline in nature (Table 1).

The mean table- 2 shows, the microbial population in *Sanjibani* prepared from Native cow was comparatively higher than the solution from Jersey cow. Maximum microbial population was recorded on 9$^{th}$ day in both Native ($137.33\times10^6 \pm 13.9$) and Jersey ($93.33 \times10^6 \pm4.80$). It shows the microbial population of *Sanjibani* attained its higher count on 9-10 days of incubation. After 10$^{th}$ day, the microbial population decline in successive days of decomposition shows, the time of applying *Sanjibani* in the field should be between 9 and 10 days to get better results.

**Table 1: Properties of *Panchagavya* and *Sanjibani***

| Parameters | *Panchagavya* | *Sanjibani* |
|---|---|---|
| N | 1.4 % | 1.03% |
| P | 0.08% | 0.04% |
| K | 0.5% | 0.5% |
| Organic C | 14% | 10.3% |
| pH | 5.6 | 7.8 |
| EC | 4.6 | 3.5 |

**Table 2: Microbial population of raw materials collected from Jersey and native cows**

| Day | Source | | 't' value (Independent sample 't' test) |
|---|---|---|---|
| | Jersey cow | Native cow | |
| 2 | 63.66 ± 2.96 | 73.63 ± 1.45 | 4.24* |
| 3 | 65.33 ± 2.9 | 74.00 ± 7.2 | 4.12* |
| 5 | 72.66 ± 7.02 | 82.67 ± 5.81 | 1.16 |
| 6 | 74.00 ± 7.02 | 96.00 ± 6.42 | 2.31 |
| 7 | 86.66 ± 2.9 | 108.00 ± 6.11 | 3.15 |
| 9 | 93.33 ± 4.80 | 137.33 ± 13.9 | 2.96 |
| 10 | 81.33 ± 3.5 | 126.00 ± 3.46 | 9.03** |
| 11 | 59.66 ± 12.5 | 96.00 ± 10.06 | 2.59 |
| 13 | 66.67 ± 8.33 | 96.00 ± 18.47 | 1.45 |
| 14 | 40.67 ± 5.7 | 66.00 ± 3.05 | 3.91* |

Independent sample't' test (Table 2) shows different in microbial population among the *Sanjibani* samples prepared using raw materials obtained from Native and Jersey breeds. In particular, the sample was statistically significant on 2$^{nd}$, 3$^{rd}$, 10$^{th}$ & 14$^{th}$ days during incubation of *Sanjibani* solution. Among the significant data, 10$^{th}$ day (t-value 9.034) is the better performer than other. It indicates the use of *Sanjibani* preparation on 10$^{th}$ days provides greater efficacy.Various yield contributing characters were studied in three different crops *C. frutescens* (chilli), *V. radiata* (green gram) and *B. campestris* (mustard) to study their response to some liquid organic manure including seed yield plant$^{-1}$. In *C. frutescens* five morphological characters were studied and it was observed that all the characters were statistically significant except the number of branches plant$^{-1}$ i.e. different treatments namely *Sanjibani* and *Panchagavya* showed significant variation with respect to three yield contributing characters like plant height, number of fruits plant$^{-1}$ and fruit length including seed yield plant$^{-1}$ (Table 3). With respect to plant height there was no significant difference between *Panchagavya* and *Sanjibani* treatment. But both the treatment showed significantly higher result than control. In case of all other characters *Panchagavya* treatment showed maximum result followed by *Sanjibani* treatment and control. This is to be mentioned that the effect was significantly higher in *Panchagavya* than *Sanjibani* and the both the treatments differ significantly than the control.

In *V.* radiata, out of seven yield contributing characters the significant variation was found in number of pods plant$^{-1}$, pod length, seeds plant$^{-1}$, weight of 100 seeds and seed yield plant$^{-1}$ (Table 3). Seed yield plant$^{-1}$ and all the yield contributing characters were found maximum in case of *Sanjibani* treated plants except two characters like plant height and number of branchesplant$^{-1}$ which were however found highest in *Panchagavya* treated plants. The characters like pods plant$^{-1}$, pod length, seeds pod$^{-1}$, 100 seed weight and seed yield plant$^{-1}$ were significantly higher than control. Out of these five characters besides pod length and 100 seed weight the rest three characters were statistically at par in both *Sanjibani* and *Panchagavya* treatments. *Sanjibani* treated plants exhibited significant effect in the character pod length. The character which exhibited maximum variation was pods plant$^{-1}$. Number of pods per plant was almost double in treatment than control. The effect of both the liquid manure was significant which might be due to the microbial population enhancement in the soil which on the other hand enhanced the availability of the nutrient to the plant. The satisfactory result of the present work could also be due to the presence of all essential macro and micro element along with the sufficient amount of plant growth hormone and vitamins (Somasundram *et al.*, 2003). In *B. campestris* (Table 3), number of siliqua plant$^{-1}$, number of seeds siliqua$^{-1}$ and seed yield plant$^{-1}$ were statistically significant as compared to other

**Table 3: Effect of *Panchagavya* and *Sanjibani* in different crops in respect to its yield contributing characters**

| Crops | Groups | Plant height (cm) | Branches plant$^{-1}$ | No. of fruits plant$^{-1}$ | Fruit length (cm) | No. of pods plant$^{-1}$ | Pod length (cm) | No. of seeds pod$^{-1}$ | No. of siliqua plant$^{-1}$ | Siliqua length (cm) | No. of seeds siliqua$^{-1}$ | Weight of 100 seeds (g) | Yield plant$^{-1}$ (g) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Capsicum frutescens* | Control | 75.20 | 21.55 | 24.55 | 7.05 | -- | -- | -- | -- | -- | -- | -- | 41.57 |
| | *Panchagavya* 3% | 89.33 | 28.66 | 79.11 | 7.54 | -- | -- | -- | -- | -- | -- | -- | 167.80 |
| | *Sanjibani* 10% | 83.44 | 28.20 | 52.33 | 7.17 | -- | -- | -- | -- | -- | -- | -- | 86.35 |
| | **LSD(0.05)** | **10.76** | **8.85** | **25.90** | **0.09** | -- | -- | -- | -- | -- | -- | -- | **43.56** |
| *Vigna radiata* | Control | 46.33 | 3.63 | -- | -- | 40.90 | 6.63 | 10.07 | -- | -- | -- | 3.47 | 7.86 |
| | *Panchagavya* 3% | 51.63 | 3.17 | -- | -- | 82.57 | 6.93 | 11.27 | -- | -- | -- | 3.91 | 24.23 |
| | *Sanjibani* 10% | 45.27 | 2.60 | -- | -- | 87.40 | 7.37 | 12.10 | -- | -- | -- | 4.22 | 27.00 |
| | **LSD(0.05)** | **25.82** | **1.61** | **--** | **--** | **19.72** | **0.45** | **0.84** | **--** | **--** | **--** | **0.12** | **3.94** |
| *Brassica campestris* | Control | 82.97 | 7.33 | -- | -- | -- | -- | -- | 24.47 | 4.37 | 21.20 | 4.37 | 0.45 |
| | *Panchagavya* 3% | 93.47 | 8.57 | -- | -- | -- | -- | -- | 84.72 | 4.65 | 25.77 | 4.65 | 1.75 |
| | *Sanjibani* 10% | 94.33 | 7.43 | -- | -- | -- | -- | -- | 73.27 | 4.66 | 25.10 | 4.66 | 1.66 |
| | **LSD(0.05)** | **19.25** | **2.05** | **--** | **--** | **--** | **--** | **--** | **23.81** | **0.55** | **3.30** | **0.55** | **0.66** |

characters studied. All the characters exhibited lowest mean in control except 100 seed weight which was lowest in the treatment (3% *Panchagavya*). The characters namely branches/ plant, no of siliqua plant, number of seeds siliqua$^{-1}$ and seed yield plant$^{-1}$ were found maximum in *Panchagavya* application. Only plant height and 100 seed weight and siliqua length were highest in *Sanjibani* (10%) treatment. The mean differences for all the characters between two treatments *i e.*, 3% *Panchagavya* and 10% *Sanjibani* were not significant. In case of both the treatments (3% *Panchagavya* and 10% *Sanjibani*) the mean of the characters like no of siliqua plant$^{-1}$, number of seeds siliqua$^{-1}$ and seed yield plant$^{-1}$ were found significantly higher than the control (Table 3).

**Table 4: Effect of organic farming practice in soil health**

| Characteristics | Before planting *kharif* black gram, 2008 | After harvesting black gram in November, 2008 | After harvesting mustard in March, 2009 |
|---|---|---|---|
| pH | 6.8 | 7.8 | 7.0 |
| EC | 0.2 | 0.3 | 0.3 |
| Organic Carbon% | 0.71 | 1.1 | 1.5 |
| Available P (kg ha$^{-1}$) | 25-40 | 37.4 | > 100 |
| Available K (kg ha$^{-1}$) | 100-200 | 196 | 250 |
| Total microbial count | 2.7x $10^7$ | 6.7x $10^8$ | 3.1 x $10^9$ |

After one year of organic practice, the pH and E.C. become close to neutral (pH-from 6.8 to 7.0 and EC- from 0.2 to 0.3 mmhos). The organic carbon increased to 1.1% from 0.71%. Available Phosphate and Potash has increased to greater extent (P – more than 3 times and K – more than 2 times). Soil parameters exhibited improvement after one year of organic cultivation (Table 4).

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