E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; 7(5): 528-531
Received: 16-03-2024
Accepted: 30-04-2024

Sutar AP
PG Student, Agronomy Section, RCSM College of Agriculture, Kolhapur, Maharashtra, India

Patil JB
Assistant Professor of Agronomy, Agronomy Section, RCSM College of Agriculture, Kolhapur, Maharashtra, India

Shende SM
Assistant Professor of Agronomy, Agronomy Section, RCSM College of Agriculture, Kolhapur, Maharashtra, India

Gedam VB
Agronomist, Regional Sugarcane and Jaggery Research Station, Kolhapur, Maharashtra, India

Gajbhiye PN
Assistant Professor of Soil Science and Agricultural Chemistry, Zonal Agriculture Research Station, Shendapark, Kolhapur, Maharashtra, India

Corresponding Author:
Shende SM
Assistant Professor of Agronomy, Agronomy Section, RCSM College of Agriculture, Kolhapur, Maharashtra, India

Effect of foliar application of different liquid formulations on growth attributing characters and yield of *kharif* Soybean (*Glycine max* (L.) Merrill)

Sutar AP, Patil JB, Shende SM, Gedam VB and Gajbhiye PN

DOI: https://doi.org/10.33545/2618060X.2024.v7.i5g.728

Abstract
An experiment entitled “Effect of foliar application of different liquid formulations on growth attributing characters and yield of *kharif* Soybean” was undertaken at P.G. Research Farm, Agronomy Section, RCSM College of Agriculture, Kolhapur during the *kharif* season of 2022 to evaluate effect of liquid formulations on growth attributing characters and yield of soybean. The obtained result showed that the application of foliar sprays of *panchagavya* (5%) at branching and at flowering stage recorded the highest growth attributing characters *viz*. plant height (56.20 cm), number of branches plant^{-1} (9.87), number of functional leaves plant^{-1} (36.20), leaf area plant^{-1} (36.76 dm^2) and dry matter accumulation plant^{-1} (33.50 g), and also the seed yield (31.30 q ha^{-1}) and the straw yield (40.30 q ha^{-1}). However, it was found at par with the foliar sprays containing two foliar application of *jeevamruth*, vermiwash and cow urine at branching and at flowering stage of soybean.

Keywords: Soybean, foliar application, Panchgavya, *Jeevamruth*, vermiwash, cow urine, growth and yield

Introduction
Soybean, recognized as the "wonder crop," holds significant importance as an oilseed crop and is notably abundant in proteins, containing around 38 to 42% protein content and 18 to 22% oil content rich in unsaturated fatty acids. Due to its cost-effectiveness as a protein source, it is commonly referred to as the "Poor Man's Meat," making it a valuable ingredient in baby food and protein supplements. Panchgavya and *Jeevamruth* are most popular and intensively used organic supplements in the field of organic farming from an ancient Vedic period. These liquid bio-stimulants were upgraded form of ancient science, that are rich in essential macro and micronutrients, beneficial microbes, enzymes and growth regulators required for the healthy growth of plants, also act as a tonic for the plants that boosted the crops yield (Rijal *et al*., 2021) [8]. *Panchagavya* is a composite of five components: cow dung, cow urine, ghee, milk, and curd. Collectively, these five elements are termed "Gavya" while their combination is referred to as *Panchagavya*. This formulation can be utilized as a foliar spray, soil drench, and seed treatment (Natarajan, 2002) [5]. Cow urine boasts disinfectant and prophylactic attributes, contributing to the purification of the environment and enhancement of soil fertility (Pathak and Ram, 2013) [7]. The Indian agricultural sector has a promising opportunity to transition towards organic farming due to its relatively lower per capita and per hectare consumption of chemical fertilizers and pesticides compared to global averages. Organically cultivated produce, including fruits, vegetables, spices, condiments, crops, medicinal plants, and aromatic plants, exhibits enhanced shelf life compared to conventionally grown counterparts. Hence, it is decided to conduct the field experiment to evaluate response of soybean to foliar application of liquid formulations on growth attributing characters.

Materials and Methods
An agronomic field investigation was carried out during *kharif* season of 2022 at the P.G. Research Farm, Agronomy Section, RCSM College of Agriculture, Kolhapur.

The trial was arranged using a randomized block design, featuring three replications and eleven treatments, consist of absolute control (T_1), spray of cow urine (5%) at branching stage (T_2), spray of cow urine (5%) at branching stage + at flowering stage (T_3), spray of *panchagavya* (5%) at branching stage (T_4), spray of *panchagavya* (5%) at branching stage + at flowering stage (T_5), spray of *jeevamruth* (5%) at branching stage (T_6), spray of *jeevamruth* (5%) at branching stage + at flowering stage (T_7), spray of vermiwash (5%) at branching stage (T_8), spray of vermiwash (5%) at branching stage + at flowering stage (T_9), urea spray (2%) at branching stage (T_{10}), urea spray (2%) at branching stage + at flowering stage (T_{11}). For all the above treatments fertilizer dose is applied as per the recommendation (50:75:45 kg NPK ha^{-1}).

Experiment conducted on gross plot of size 5.4 m × 5.0 m and net plot size 3.6 m × 4.0 m. The soil fertility status of experimental site was medium in organic carbon percentage, low in available nitrogen, very high in available phosphorus, and high in available potassium. The electrical conductivity and pH values were 0.15 dSm^{-1} (normal-low saline) and 7.52 (neutral), respectively. Application of liquid formulations as per treatment were done as a solution in water at the rate of 500 lit. ha^{-1} with the help of knapsack sprayer. The various biometric observations on the growth and yield contributing characters of soybean were recorded on five randomly selected plants from each net plot during the course of investigation.

Results and Discussion

A) Effect of different liquid formulations sprays on growth attributing characters of soybean

1. Effect of liquid formulations sprays on plant height of soybean

At 84 DAS the average mean plant height was 51.94 cm from which treatment containing foliar application of *panchagavya* (5%) at branching stage and at flowering stage exhibited highest plant height measuring 56.20 cm which is significantly higher over other treatments; however, foliar treatments containing spray of *panchagavya* (5%) at branching stage + at flowering stage, spray of *jeevamruth* (5%) at branching stage + at flowering stage, spray of vermiwash (5%) at branching stage + at flowering stage, spray of cow urine (5%) at branching stage + at flowering stage and urea spray (2%) at branching stage + at flowering stage were found statistically at par. The lowest plant height was observed in absolute control. The results of present study are found parallel with the earlier reported by Shiri *et al*., (2020) [9], Rijal *et al*., (2021) [8], Chaudhari *et al*., (2018) [1], and Nagar *et al*., (2016) [4].

2. Effect of liquid formulations sprays on number of branches

Highest number of branches was observed in treatment containing foliar spray of *panchagavya* (5%) at branching stage and at flowering stage measuring 9.87 which was found at par with foliar application treatments including spray of *jeevamruth* (5%) at branching stage + at flowering stage, urea spray (2%) at branching stage and spray of cow urine (5%) at branching stage + at flowering stage but significantly superior over the other foliar supplication treatments. The lowest mean number of branches was recorded in treatment of absolute control. The results of present study are found parallel with the earlier reported by Nagar *et al*., (2016) [4], Machhar *et al*., (2021) [3] and Chaudhari *et al*., (2018) [1].

3. Effect of liquid formulations sprays on number of functional leaves

At 84 DAS spray of *panchagavya* (5%) at branching stage and at flowering stage had the highest mean number of functional leaves i.e. 36.76 which was significantly superior over rest of treatments except treatment including foliar spray of *jeevamruth* (5%) at branching stage + at flowering stage which shows no significant difference from the foliar application of *panchagavya* (5%) at branching stage + at flowering stage. The lowest mean number of functional leaves was found in treatment of absolute control.

4. Effect of liquid formulations sprays on leaf area

At 84 DAS, treatment containing spray of *panchagavya* (5%) at branching stage and at flowering stage had the highest mean leaf area but it was found at par with foliar application treatments including spray of *jeevamruth* (5%) at branching stage + at flowering stage, spray of vermiwash (5%) at branching stage + at flowering stage, spray of cow urine (5%) at branching stage + at flowering stage and urea spray (2%) at branching stage + at flowering stage. The lowest mean leaf area was observed in absolute control treatment. The results of present study were found parallel with the earlier reported by Jagdale *et al*., (2020) [2] and Nithila & Sivakumar (2017) [6].

Table 1: Effect of different foliar application of liquid formulations on growth attributing characters of soybean

Treatments	Growth Attributing Characters (84 DAS)				
	Plant Height (cm)	No. of Branches $plant^{-1}$	No. of Functional leaves $plant^{-1}$	Leaf area $plant^{-1}$ (dm^2)	Dry matter $plant^{-1}$ (g)
T_1: Absolute control	47.90	8.07	28.80	29.40	29.80
T_2: Spray Cow Urine (5%) at Branching Stage	49.60	8.33	30.33	30.45	31.10
T_3: Spray Cow Urine (5%) at Branching Stage + At Flowering Stage	54.30	9.60	32.13	35.00	33.90
T_4: Spray *Panchagavya* (5%) at Branching Stage	50.20	8.80	31.00	32.00	31.85
T_5: Spray *Panchagavya* (5%) at Branching Stage + At Flowering Stage	56.20	9.87	36.20	36.76	34.80
T_6: Spray *Jeevamruth* (5%) at Branching Stage	50.18	8.67	30.87	31.80	31.50
T_7: Spray *Jeevamruth* (5%) at Branching Stage + At Flowering Stage	55.36	9.60	34.20	35.60	34.40
T_8: Spray Vermiwash (5%) at Branching Stage	50.10	8.40	30.53	31.40	31.10
T_9: Spray Vermiwash (5%) at Branching Stage + At Flowering Stage	55.30	9.60	32.60	35.40	34.20
T_{10}: Urea Spray (2%) at Branching Stage	49.00	8.20	29.13	29.50	30.20
T_{11}: Urea Spray (2%) at Branching Stage + At Flowering Stage	53.29	9.53	31.40	34.40	33.20
S.Em. ±	1.63	0.11	1.01	1.30	0.99
LSD (P = 0.05)	4.82	0.34	2.99	3.85	2.95
General mean	51.94	8.97	31.56	32.88	32.37

5. Effect of liquid formulations sprays on dry matter production

After 84 DAS highest mean dry matter production was observed in foliar application treatment containing spray of *panchagavya* (5%) at branching stage and at flowering stage measuring 34.80 g, which was significantly superior over the foliar application treatments; however, it was found at par with the foliar application treatments including spray of *jeevamruth* (5%) at branching stage + at flowering stage, spray of vermiwash (5%) at branching stage + at flowering stage and spray of cow urine (5%) at branching stage + at flowering stage. Lowest mean dry matter production was recorded in treatment absolute control treatment. The results of present study are parallel with the earlier reported by Nagar *et al.*, (2016) [4].

B) Effect of different liquid formulations sprays on yield of soybean

1. Effect of liquid formulations sprays on seed yield (q ha^{-1})

Among the treatments the highest seed yield was recorded in foliar application treatment containing two spray of *panchgavya* at flowering and branching stage, which was at par with foliar application treatments including two sprays of vermiwash, *jeevamrutha* and cow urine. Lowest seed yield was recorded in treatment of absolute control containing application of RDF only. These clearly indicates that along with RDF, spray of micronutrients containing formulations play significant role in increasing seed yield. Also, the treatment containing only one spray of *panchgavya*, vermiwash, *jeevamrutha*, cow urine and urea at branching stage does not show significant difference in yield when compared with absolute control treatment. The seed yield witnessed a growth of 7.37% for foliar application treatment containing two spray of *panchgavya* at flowering and branching stage compared to foliar application treatment of spray of *jeevamruth* (5%) at branching stage + at flowering stage, followed by incremental increases of 7.44%, 8.91%, 13.90%, 18.69%, 20.57%, 22.55%, 23.91%, 26.67%, and 28.49% over the foliar application treatments.

2. Effect of liquid formulations sprays on straw yield (q ha^{-1})

Among the treatments, the treatment that included two sprays of *panchgavya* at the flowering and branching stages yielded the highest amount of straw. This result was comparable to the treatments that incorporated two sprays of vermiwash, *jeevamrutha*, cow urine, and urea. On the other hand, the lowest straw yield was observed in treatment of absolute control, which was subjected to the application of only RDF. Furthermore, the treatment that employed only one spray of *panchgavya*, vermiwash, *jeevamrutha*, cow urine, and urea at the branching stage did not demonstrate a notable variation in yield when compared with absolute control treatment. Treatment T_5 resulted in a percentage increase in straw yield of 2.28, 3.06, 5.50, 8.33, 13.20, 15.47, 17.84, 19.58, 21.75 and 22.49 over the rest of the treatments of foliar spray. The results of present study are found in parallel with the earlier reported by Jagdale *et al*., (2020) [2] and Sutar *et al*., (2019) [10].

3. Effect of liquid formulations sprays on harvest index

There were no significant variations in the mean harvest index among the treatments, with the mean harvest index remaining at 42.77%. The foliar application treatment of two sprays of *panchgavya* at the flowering and branching stages had the highest harvest index, measuring 43.72%.

Table 2: Effect of different foliar application of liquid formulations on yield of soybean

Treatments	Seed Yield (q ha^{-1})	Straw Yield (q ha^{-1})	Harvest Index (%)
T_1: Absolute control	24.36	32.90	42.54
T_2: Spray Cow Urine (5%) at Branching Stage	25.26	33.70	42.84
T_3: Spray Cow Urine (5%) at Branching Stage + At Flowering Stage	28.74	38.20	42.93
T_4: Spray *Panchagavya* (5%) at Branching Stage	26.37	35.60	42.55
T_5: Spray *Panchagavya* (5%) at Branching Stage + At Flowering Stage	31.30	40.30	43.72
T_6: Spray *Jeevamruth* (5%) at Branching Stage	25.96	34.90	42.66
T_7: Spray *Jeevamruth* (5%) at Branching Stage + At Flowering Stage	29.15	39.40	42.52
T_8: Spray Vermiwash (5%) at Branching Stage	25.54	34.20	42.75
T_9: Spray Vermiwash (5%) at Branching Stage + At Flowering Stage	29.13	39.10	42.69
T_{10}: Urea Spray (2%) at Branching Stage	24.71	33.10	42.74
T_{11}: Urea Spray (2%) at Branching Stage + At Flowering Stage	27.48	37.20	42.49
S.Em. ±	0.89	1.14	1.34
LSD (P = 0.05)	2.63	3.37	NS
General mean	27.09	36.24	42.77

Conclusion

All growth attributes *viz*. plant height, number of branches, number of functional leaves plant^{-1}, leaf area plant^{-1}, dry matter production and yield attributes *viz*. seed yield, straw yield exhibited significantly higher values when treated with spray of *panchagavya* at both the branching and flowering stages in comparison to the other treatments and it was aligned with treatments that contained two sprays of *jeevamruth*, vermiwash, cow urine and urea except in regards with number of functional leaves where treatment containing two sprays of *panchagavya* (5%) was only comparable with treatments containing two sprays of *jeevamruth* and vermiwash.

Acknowledgements

Authors sincerely thank the Agronomy Section, RCSM College of Agriculture, Kolhapur, Maharashtra, India for ease and smooth conduct of field, laboratory and experimental work and also for providing all the facilities to conduct research. Authors sincerely acknowledges the work of A.P. Sutar and Dr. J.B. Patil for constructing and conducting the smooth experiment. A heartful thanks to Dr. V. B. Gedam for initial review of manuscript and authors also thankful to Prof. S. M. Shende for preparation of manuscript.

Referances

1. Chaudhari JB, Patel BJ, Patel KM, Patel GM. Nutrient management with panchgavya in *kharif* cluster bean (*Cyamopsis tetragonoloba* L.). Journal of Food Legumes. 2018;31(4):212-214.
2. Jagdale A, Dhamak A, Pagar B, Wagh P. Effect of different

organic formulations on growth and yield of soybean. International Journal of Chemical Studies. 2020;8(4):1634-1638.
3. Machhar RG, Hajari RV, Hadiya GD, Chauhan RB. Effect of foliar application of organic and inorganic nutrients sources on growth, yield attributes, yield and quality of black gram (*Vigna mungo* (L.) Hepper). The Pharma Innovation Journal. 2021;10(9):1463-1465.
4. Nagar G, Abraham T, Sharma DK. Effect of different solid and liquid forms of organic manure on growth and yield of soybean [*Glycine max* (L.) Merrill]. Advanced Research Journal Crop Improvement. 2016;7(1):56-59.
5. Natarajan K. Other Indian Press; Mapusa, Goa, India: Panchagavya–a manual, 2002, 333.
6. Nithila S, Sivakumar R. A study on crop establishment and harvest indices of green gram and black gram under sodicity stress using organic methods. Journal of Pharmacognosy and Phytochemistry. 2017;6(6S):327-329.
7. Pathak RK, Ram RA. Bio-enhancers: A potential tool to improve soil fertility, plant health in organic production of horticultural crops. Progressive Horticulture. 2013;45(2):237-254.
8. Rijal R, Kumar A, Maity P, Bisoyi S, Chattarjee S, Nelli R. Effect of bio-manures on growth and development of tomato (*Solanum lycopersicum* L.): A review. Plant Cell Biotechnology Molecular Biology. 2021;22:119-135.
9. Shiri T, Kumar A, Priyta V, Kumar A, Singh G, Saifi N. Stimulus of Panchgavya Bio-Manure (PGBM) on developmental growth as well as harvest of Pisum sativum. Journal of Pharmacognosy and Phytochemistry. 2020;9(3):905-910.
10. Sutar AU, Vaidya PH, Deshmukh AV, Lilhare MA, Landge RB. Effect of foliar application of vermiwash, compost tea and *panchagavya* on yield and quality of soybean in Inceptisol. Journal of Pharmacognosy and Phytochemistry. 2019;8(5):1228-1230.