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EFFECT OF ORGANIC, NATURAL AND INTENSIFICATION OF NATURAL FARMING PRACTICES WITH FOLIAR APPLICATION OF LIQUID ORGANIC MANURES (LOM'S) ON GROWTH AND PRODUCTIVITY OF SOYBEAN (*GLYCINE MAX*)

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ABSTRACT

Soybean [*Glycine max* (L.) Merr.] is the most important major oil seed crop. The average productivity of soybean is low under natural farming when compared to organic and conventional farming. Hence, the current study was carried out to bridge the yield gap caused by natural farming practice with integration of organic farming practices and liquid organic manures. The present investigation was carried out at Main Agricultural Research Station, University of Agricultural Sciences, Dharwad in *vertisols* under protective rainfed conditions. The experiment was executed in a strip design with three replications and three farming practices (organic, natural and intensification of natural farming) in main plot and five liquid organic manures (vermiwash@ 10%, panchagavya@ 5%, jeevamrutha@ 20%, cow urine@ 10% and water spray) as foliar sprays at critical crop stages in sub plot. The influence of farming practices and liquid organic manures on growth, yield parameters, yield of soybean (variety: Dsb 34) was studied and carried out during *kharif,* 2022-23 and 2023-24. The pooled data of two years concluded that, organic farming recorded significantly higher plant height, number of branches plant^{-1}, leaf area, leaf area index and yield attributing characters *viz*., total number pods per plant (54.0), number of healthy pods per plant (52.0), seed yield plant^{-1} (21.41 g.), seed yield (2,977 kg ha^{-1}) and straw yield (4,808 kg ha^{-1}). Similarly, among the foliar sprays, panchagavya @ 5% as foliar sprays four times at critical stages resulted in higher growth parameters and yield attributing characters and yield. With addition of 50 per cent of recommended organic manures as of organic farming practices to natural farming treatment resulted in 5.3 and 19.6 per cent increase in seed and halum yields respectively.

Keywords **:** Economics, Liquid organic manures, Intensification of Natural Farming, Natural Farming, Organic Farming, Soybean, Yield.

Introduction

Soybean (*Glycine max* L. Merr.) is the world's most important seed legume, which contributes to 25 per cent of the global edible oil, about two-thirds of the world's protein concentrate for livestock feeding. Soybean meal is a valuable ingredient in formulated feeds for poultry and fish. In soybean, natural farming management is comprised of three parts like nutrient, pest and disease management without use of inorganic sources of inputs like fertilizers, pesticides and chemicals (Anonymous, 2023). In India, soybean is introduced as a major rainfed oilseed crop (Kumar, 2021), but for the purpose of enhancement in the cropping intensity and resultant increase in the profitability per unit land area soybean crop is also cultivated during *Kharif* season in Northern transitional zone and North Eastern transitional zone of Karnataka

(Zone 8 and Zone 1). In India, during 2022-23, soybean was cultivated in an area of 13.00 million ha with the production of 11.00 million tonnes and average productivity of 850 kg per ha (Anonymous, 2024a). In Karnataka, soybean is cultivated over an area of 4.69 lakh ha with a production of 4.58 lakh tonnes and an average productivity of 1212 kg per ha which is higher than national average productivity (Anonymous, 2024b).

Natural farming and organic farming both are sustainable regenerative and climatic resilient alternative agricultural practices that prioritize soil health (in terms of physical, chemical and biological properties), biodiversity and environmental sustainability. Both farming practices improve soil health, reduce chemical use, increase crop yields, reduce environmental impact, improve livelihoods and health of consumers as well as farmers and provide employment which stops immigration of rural people (Aziz *et al*., 2017). Optimum yield cannot be attained without ensuring the adequate and balanced supply of nutrients to the plant. Natural farming is not the paradigm for sustainable agriculture and food security, but smart combinations of organic and natural farming can contribute towards sustainable productivity and increases in food security. Permanent plot experiments conducted over 4 years at UAS, Dharwad under natural farming project showed decline in yield upto 25 per cent under natural farming (Chandrashekara *et al*., 2020). Hence, the present study was undertaken in soybean to evaluate the performance of different farming practices and natural+ organic farming practices and to what extent the integration of farming practices and foliar supplementation of nutrients through LOM's will bridge the yield gaps in soybean.

Materials and Methods

Experimental site and details: The experiment was laid out in strip plot design with three replications on vertisols of northern transitional zone of Karnataka (Zone- 8). The experiment was conducted with a rust resistant variety 'Dsb-34' with a spacing of 30 cm × 10 cm during *kharif*, 2022-23 and 2023-24 on permanant plots in both the years on *vertisols* with medium black soils. The experiment was laid out in strip plot design and strip-I consisting of three farming practices *viz*., Natural Farming (NF), Intensification of Natural Farming (INF), Organic Farming (OF) and strip-II consists of foliar application of liquid organic manures *viz*., Vermiwash (VW) @ 10%, panchagavya (PG) @ 5 %, Jeevamrutha (JA) @ 20 %, Cow Urine (CU) @ 10% and Water Spray (WS). The foliar applications were done during critical crop growth stages *viz*., seedling stage, bud formation/ flowering stage, pod formation stage and pod development stage. In natural farming (NF) the seeds were treated with beejamrutha before sowing and jeevamrutha sprinkled on soil and crops at 21 days interval @ 500 l ha^{-1} from 21 DAS to 90 DAS (4 times). Exsitu green manuring of *Glyricidia* was grown on bunds and used as mulch at 30 DAS. The pests and diseases were controlled through *Neemastra*, *Agniastra*, *Dashparni*, *Shuntiastra* and Sour butter milk in natural farming and INF. In intensification of natural farming (INF) in addition to natural farming practices 50 per cent of the organic manures recommended in OF treatment were added. In organic farming the seeds were treated with *Trichoderma* (6 g per kg of seed), *Rhizobium* and Phosphorus solubilizing bacteria (PSB) (1250 g each per ha) at the time of sowing. Nutrients were supplied through organic manures (which were equivalent to 100 per cent recommended dose of phosphorus (RDP)) through FYM (8.7 t per ha) and vermicompost (5.6 t per ha) @ 50% each, in addition to recommended dose of FYM @ 6.0 t per ha. Foliar application of liquid organic manures (LOM's) were done as per the treatments in organic farming, natural farming and intensification of natural farming at different critical stages.

Soil sample collection and analysis: The soil chemical properties data during both the years are given in table. The experiment was carried out in permanent plots of natural farming treatments initiated from 2018-19.

Table 1: Soil chemical properties (Initial values) of the experimental field during *kharif*, 2022-23 and 2023-24

Sl. No.	Particulars	*kharif*, 2022-23			*kharif*, 2023-24		
		OF	NF	INF	OF	NF	INF
1.	Soil reaction (1:2.5)	7.33	7.03	7.00	7.32	7.02	7.00
2.	Electrical conductivity (1:2.5) (dS per m)	0.123	0.123	0.122	0.124	0.122	0.121
3.	Organic carbon (g per kg)	6.54	6.08	6.23	6.55	6.09	6.28
4.	Available N (kg per ha)	248.18	230.95	230.50	251.36	244.16	236.38
5.	Available P_2O_5 (kg per ha)	45.01	41.45	43.64	47.36	43.45	46.15
6.	Available K_2O (kg per ha)	364.01	348.40	341.65	367.28	353.65	355.65
7.	Copper (mg per kg)	1.34	1.12	1.28	1.36	1.14	1.31

8.	Iron (mg per kg)	5.98	4.86	4.99	5.76	4.95	5.01
9.	Manganese (mg per kg)	6.76	4.86	4.99	6.76	4.94	5.02
10.	Zinc (mg per kg)	0.94	0.69	0.71	0.98	0.71	0.73

Note: OF: organic farming, NF: natural farming, INF: intensification of natural farming

The plant height was recorded from the ground level to the top of the fully opened leaf from randomly selected five plants at 30 DAS, 60 DAS and at harvest. The mean height was recorded as plant height in centimetres. Similarly, randomly five plants were selected to record the number of branches plant^{-1} in a plot and mean value calculated. Leaf area was measured by leaf disc method as suggested by vivekanandan *et al*. (1972). Fifty discs of known size were taken through cork borer from randomly selected leaves of five plants. Both discs and remaining leaf blades were oven dried at 70^{o}C for two days and leaf area was calculated by using formula and expressed in dm^2 plant^{-1}.

$$\text{Leaf area (dm}^2\text{ plant}^{-1}) = \frac{\text{Dry weight of green leaf let (g plant}^{-1}\text{) including 50 green leaf lets}}{\text{Dry weight of 50 green leaf lets (g)}} \times \text{Area of 50 leaf lets (dm}^2\text{)}$$

Leaf area index was calculated at 30 and 60 DAS by dividing the leaf area plant^{-1} by land area occupied by single plant (Sestak *et al*., 1971).

$$\text{LAI} = \frac{\text{Leaf area (dm}^2\text{)}}{\text{Land area occupied by plant (dm}^2\text{)}}$$

Leaf area duration (LAD) is calculated at 0-30 DAS, 30-60 DAS by using formula (Power *et al*., 1967).

$$\text{LAD} = \frac{\text{Li} + \text{L (i+1)}}{2} \times (t_2 - t_1)$$

Where,

LAD- Leaf Area Duration, Li- LAI at ith stage, L(i+1)= LAI at (i+1)th stage, t_2-t_1= Time Interval between ith and (i+1)th stage in days

Total number of pods, number of healthy pods and seed yield per plant were counted from five randomly selected plants and the mean value was computed. Test weight was weighed for five samples and the mean value was calculated. The Seed yield and Haulm yield per plot were recorded separately and expressed as kg per ha. Statistical significance was tested with 'F' test at 5 % level of probability and compared the treatment means with critical difference. Means followed by the same letters do not differ significantly by DMRT at P=0.05.

Results and Discussion

Plant height and number of branches plant^{-1} at 30, 60 DAS and at harvest

Among the farming practices, significantly higher plant height (24.08, 50.61 and 54.63 cm, respectively shown in Table 2) and number of branches plant^{-1} (3.31, 6.24 and 6.96 plant^{-1}, respectively shown in Table 3) at 30 DAS, 60 DAS and at harvest stage was observed in organic farming as compared to INF and NF. The organic manures improve the physio chemical properties *viz*., porosity, aggregate stability, drainage and aeration of soil, which resulted in increased growth depicted in plant height and number of branches plant^{-1}. The results obtained under the study are in closer agreement with Dekhane *et al*., (2017). Among the foliar sprays, significantly higher plant height (24.48, 50.54 and 56.97 cm at 30, 60 DAS and at harvest respectively) and number of branches plant^{-1} (3.04, 6.43 and 6.74 at 30, 60 DAS and harvest respectively) were observed in panchagavya @ 5% than all other liquid organic manures (LOM's). Mahantesh and Nekar (2024) revealed that foliar application of panchagavya @ 3.0 per cent significantly increases the growth parameters *viz*., plant height (118.4 and 131.7 cm), stem girth (2.56 and 3.25 cm) and number of leaves per plant of tomato (80.5 and 104.2) at 50 and 75 DAT, respectively. The panchagavya was known for its beneficial effects toward better crop performance (Amalraj *et al*., 2013). Among the interactions between farming practices and LOM's there was no significant difference in plant height of soybean at 30 DAS. At 60 DAS (55.67 cm) and at harvest (62.59 cm) stages, significantly taller plants were observed in organic farming with panchagavya @ 5% (A_2B_2) than all other treatment combinations on pooled data basis. The number of branches plant^{-1}, did not differed significantly at 60 DAS. However, significant results were observed at 30 DAS and at harvest stages. Ssignificantly higher number of branches were recorded in organic farming with panchagavya @ 5% (A_2B_2) than all other treatment combinations (3.99 at 30 DAS and 7.92 at harvest stages).

Leaf area plant^{-1}, Leaf area index and leaf area duration at 30 and 60 DAS:

Leaf is a mirror for conducting the photosynthesis. Photosynthesis, is the process by which plants convert

light energy into chemical energy. Photosynthetic pigments, such as chlorophyll, are responsible for absorbing light energy. Hence, leaf area measurement helps to determine the amount of photosynthetic pigments in the cells of crop leaves and also leaf area is one of the key parameters of tracking the plant's growth (Cavender and Bazzaz, 2004). In the present experiment the leaf area plant^{-1} was maximum with organic farming (3.41 and 11.52 dm^2 per plant) at 30 and 60 DAS, respectively than INF and NF (Table 4). Similar findings were mentioned in soybean by Ciampitti and Salvagiottif (2018). The leaf area of plants per unit land area (LAI) is an expression of the canopy density of a crop population and plays role in yield formation. The leaf area index (LAI) is thus an important indicator of radiation and precipitation interception, energy conversion as well as water balance (Singh, 2011). The leaf area index (LAI) (1.14 and 3.82 represented in Table 5) and leaf area duration (LAD) (17.05 and 74.30 days represented in Table 6) were higher with organic farming than NF and INF at both 30 and 60 DAS. The enhancement in leaf area, LAI and LAD under panchagavya foliar application further supports the increased trend in yield. The leaf area plant^{-1} values were 3.68 and 11.96 dm^2, LAI values of 1.23 and 3.99 at 30 and 60 DAS, respectively, indicate improved canopy development, which leads to higher photosynthetic capacity. The higher LAD values, (18.42 and 78.21 at 0-30 and 30-60 DAS, respectively) highlight the photosynthetically active leaf area which sustained for longer duration under panchagavya foliar application, thus increasing the crop's productivity potential. This sustained leaf area activity is crucial for optimizing the use of light, water and nutrients throughout the growing period, leading to higher biomass accumulation. Among the interactions, the higher leaf area plant^{-1} (3.87 and 13.08 dm^2), leaf area index (LAI) (1.29 and 4.36), leaf area duration (LAD) (19.35 and 84.77 days, at 30 and 60 DAS respectively) was observed in best treatment combination *i.e.* organic farming with panchagavya (A_2B_2) due to combined effect of organic manures applied to the soil along with biofertilizers inoculated seeds and panchagavya act as growth promoting substance helps in higher availability of soil nutrients in solution and increased uptake by crop.

Yield attributing characters

Yield attributing characters like total number of pods plant^{-1} (48.36), number of healthy pods plant^{-1} (45.96) and seed yield plant^{-1} (21.41 g) were higher with organic farming and lower with natural farming (31.07, 26.67 and 11.52 g, respectively) (Table 7). Application of FYM, vermicompost and biofertilizers improves N, P and K content and further improves soil properties which makes soil fertile and healthy. Application of organic manures in soybean causes diversion of energy from vegetative parts to reproductive parts and leading to healthy pod development and increased yield which was confirmed by Pooja *et al*., 2022. Among the foliar sprays, total number of pods plant^{-1} (44.89), number of healthy pods plant^{-1} (41.89) and seed yield plant^{-1} (18.36 g) were higher with panchagavya @ 5 % application and lower with control (33.22, 29.40 and 15.50 g, respectively). The easy transport of nutrients and growth stimulants (IAA and GA) from foliar spray of panchagavya might be the reason for enhancement of yield attributes. panchagavya is the combined formulation of five products from cow: milk, curd, ghee, urine and dung. It is a mixture of microorganisms, including *Azospirillum* Sp., *Azatobacter* Sp., *Pseudomonas* Sp., and many other beneficial microorganisms. Moreover, it also contains proteins, lipid, carbohydrates, micro nutrients and antioxidants which are helpful for crop growth, yield attributing characters and economic yield (Sarma and Talukdar, 2024). Among the interactions, all yield parameters were higher with organic farming with panchagavya @ 5% (A_2B_2) *viz*., total number of pods plant^{-1}, number of healthy pods plant^{-1} and seed yield plant^{-1} (54.00, 52.00 and 23.14 g respectively). Test weight did not differ significantly with farming practices and foliar sprays.

Seed yield and halum yield

Among the different farming practices, organic farming (OF) recorded higher seed yield and haulm yield on pooled basis (2977 and 4808 kg per ha, respectively) than intensification of natural farming (INF) (2703 and 3752 kg per ha, respectively) and natural farming (NF) (2566 and 3136 kg per ha, respectively) (Table 8). INF and NF registered 9.20 and 13.80 per cent lower seed yields than OF. The addition of organic manures in the form of FYM and vermi compost along with biofertlizers releases the nutrients like N, P, K and enhances growth as it contain several enzymes, plant growth hormones like, cytokinins, gibberlins and vitamins along with micro and macro nutrients (Jaggi *et al.,* 2023). These added nutrients apart from improving physico-chemical properties of soil resulted in higher seed yield and halum yields. panchagavya @ 5% application increased 6.43, 10.45, 13.17 and 21.07 per cent seed yield and 5.22, 5.32, 10.10 and 16.24 haulm yield over jeevamrutha, cow urine, vermi wash and control treatments, respectively. panchagavya application improves the soil rhizosphere through release of growth enchancing enzymes and leads to mobilization

and solubilization of nutrients and made available for the plant uptake (Vinay *et al.,* 2020). Increased plant uptake resulted in enchanced yield attributes and ultimately resulted in yield. This result was ratified with the finding of Aher *et al.* (2019) that, the treatments receiving organic manure along with panchagavya increased soybean seed yield by 9-13% over RDF. The best treatment combination *i.e.* organic farming with panchagavya @ 5 % registered maximum values of seed and haulm yields (3250 and 5180 kg per ha).

Conclusion

The present investigation concluded based on pooled data of two years that application of 50 per cent recommended dose of organic farming in the form of organic manures to natural farming can be recommended for bridging the yield loss caused by practicing natural farming alone, which is a eco-friendly, environmentally sound and sustainable in nature, besides improving the chemical properties of soil and in turn higher growth and productivity of soybean under *vertisols* in Northern Transition Zone of Karnataka (India).

Table 2: Plant height (cm) of soybean as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures

Treatment	**Plant height (Pooled data)**											
→ Farming practices	**At 30 DAS**				**At 60 DAS**				**At harvest**			
↓ LOM's	**A_1:NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**
B_1: Vermiwash @ 10%	19.50	23.30	20.43	**21.08**	40.77	48.93	48.18	**45.96**	45.00	50.43	47.98	**47.80**
B_2:panchagavya @ 5 %	22.50	26.50	24.43	**24.48**	47.26	55.67	48.71	**50.54**	51.82	62.59	56.51	**56.97**
B_3: *Jeevamrutha* @ 20 %	19.60	24.40	21.73	**21.91**	39.40	49.09	46.38	**44.96**	46.53	54.23	48.88	**49.88**
B_4: Cow urine @ 10 %	20.40	25.10	23.13	**22.88**	42.37	52.68	46.08	**47.04**	48.44	59.11	51.63	**53.06**
B_5: Water spray (control)	17.10	21.10	18.23	**18.81**	36.55	46.69	43.13	**42.12**	41.99	47.45	45.68	**45.04**
Mean	**19.82**	**24.08**	**21.59**		**41.27**	**50.61**	**46.49**		**46.62**	**54.63**	**49.81**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**	
A	0.37		1.03		0.71		1.98		1.12		3.11	
B	0.52		1.21		0.84		1.95		1.13		2.61	
A X B	0.83		NS		1.04		2.46		1.30		3.18	

Table 3: Number of branches plant^{-1} of soybean at 30, 60 DAS and at harvest as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures.

Treatment	**Number of branches plant^{-1} (Pooled data)**											
→ Farming practices	**At 30 DAS**				**At 60 DAS**				**At harvest**			
↓ LOM's	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**
B_1: Vermiwash @ 10%	1.90	3.12	2.14	**2.39**	4.91	5.98	5.67	**5.52**	5.11	6.38	6.24	**5.91**
B_2:panchagavya @ 5 %	2.12	3.99	3.01	**3.04**	5.99	6.82	6.49	**6.43**	5.78	7.92	6.53	**6.74**
B_3: *Jeevamrutha* @ 20 %	1.94	3.30	2.51	**2.69**	5.33	6.31	6.01	**5.88**	5.63	7.31	6.71	**6.55**
B_4: Cow urine @ 10 %	1.97	3.80	2.68	**2.91**	5.61	6.49	6.20	**6.10**	6.11	6.99	6.19	**6.43**
B_5: Water spray (control)	1.85	2.34	2.01	**2.07**	4.51	5.60	5.40	**5.17**	4.79	6.20	5.79	**5.59**
Mean	**1.96**	**3.31**	**2.47**		**5.27**	**6.24**	**5.95**		**5.48**	**6.96**	**6.20**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		S.Em. ±		CD at 5 %		**S.Em. ±**		**CD at 5 %**	
A	0.05		0.13		0.08		0.23		0.14		0.39	
B	0.07		0.16		0.16		0.36		0.16		0.36	
A X B	0.12		0.27		0.27		NS		0.27		0.61	

A_1: Natural Farming, A_2: Organic Farming, A_3: Intensification of natural farming with required organic farming practices, C_1:Recommended Package of Practices, C_2:Chemical farming Means followed by the same letters do not differ significantly by DMRT at P=0.05

Table 4: Leaf area plant^{-1} (dm^2) of soybean at 30 and 60 DAS as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures

Treatment	**Leaf area plant^{-1} (Pooled data)**							
→ Farming practices	**At 30 DAS**				**At 60 DAS**			
↓ LOM's	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**
B_1: Vermiwash @ 10%	2.65	3.10	2.87	**2.87**	8.56	10.78	8.88	**9.41**
B_2:panchagavya @ 5 %	3.82	3.87	3.37	**3.68**	10.45	13.08	12.34	**11.96**
B_3: *Jeevamrutha* @ 20 %	3.02	3.50	2.92	**3.15**	9.01	11.44	9.35	**9.93**
B_4: Cow urine @ 10 %	3.01	3.60	3.38	**3.33**	9.89	12.27	11.35	**11.17**
B_5: Water spray (control)	2.38	2.98	2.81	**2.72**	7.95	10.01	8.01	**8.66**
Mean	**2.98**	**3.41**	**3.07**		**9.17**	**11.52**	**9.99**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**	
A	0.12		0.32		0.23		0.64	
B	0.14		0.33		0.33		0.76	
A X B	0.16		0.37		0.36		0.85	

Table 5: Leaf area index of soybean at 30 and 60 DAS as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures

Treatment	**Leaf area index (LAI) (Pooled data)**							
→ Farming practices	**At 30 DAS**				**At 60 DAS**			
↓ LOM's	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**
B_1: Vermiwash @ 10%	0.88	1.03	0.96	**0.96**	2.85	3.59	2.96	**3.14**
B_2:panchagavya @ 5 %	1.27	1.29	1.12	**1.23**	3.48	4.36	4.11	**3.99**
B_3: *Jeevamrutha* @ 20 %	1.01	1.17	0.97	**1.05**	3.00	3.81	3.12	**3.31**
B_4: Cow urine @ 10 %	1.00	1.20	1.13	**1.11**	3.30	4.09	3.78	**3.72**
B_5: Water spray (control)	0.79	0.99	0.94	**0.91**	2.65	3.34	2.67	**2.89**
Mean	**0.99**	**1.14^a**	**1.02**		**3.06**	**3.82**	**3.40**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**	
A	0.04		0.11		0.08		0.21	
B	0.05		0.11		0.11		0.25	
A X B	0.05		0.12		0.12		0.28	

A_1: Natural Farming, A_2: Organic Farming, A_3: Intensification of natural farming with required organic farming practices, C_1:Recommended Package of Practices, C_2:Chemical farming

Means followed by the same letters do not differ significantly by DMRT at P=0.05

Table 6: Leaf area duration (LAD) of soybean at 0-30 DAS and 30-60 DAS as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures

Treatment	**Leaf area duration (LAD) (Pooled data)**							
→ Farming practices	**At 0- 30 DAS**				**At 30-60 DAS**			
↓ LOM's	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**	**A_1: NF**	**A_2: OF**	**A_3: INF**	**Mean**
B_1: Vermiwash @ 10%	13.25	15.50	14.35	**14.37**	56.05	69.40	58.75	**61.40**
B_2:panchagavya @ 5 %	19.09	19.35	16.83	**18.42**	71.34	84.77	78.53	**78.21**
B_3: *Jeevamrutha* @ 20 %	15.12	17.50	14.62	**15.74**	60.17	74.70	61.37	**65.41**
B_4: Cow urine @ 10 %	15.04	18.00	16.90	**16.65**	64.49	79.35	73.65	**72.50**
B_5: Water spray (control)	11.92	14.90	14.05	**13.62**	51.67	64.95	54.10	**56.91**
Mean	**14.88**	**17.05**	**15.35**		**60.74**	**74.30**	**66.28**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		S.Em. ±		CD at 5 %	
A	0.58		1.61		1.50		4.17	
B	0.71		1.64		1.93		4.45	
A X B	0.78		1.86		2.17		NS	

Table 7: Total number of pods plant^{-1}, number of healthy pods plant^{-1} and seed yield plant^{-1} of soybean at 30, 60 DAS and at harvest as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures

Treatment	Yield attributes (Pooled data)											
→ Farming practices	Total number of pods plant^{-1}				Number of healthy pods plant^{-1}				Seed yield plant^{-1}			
↓ LOM's	A_1: NF	A_2: OF	A_3: INF	Mean	A_1: NF	A_2: OF	A_3: INF	Mean	A_1: NF	A_2: OF	A_3: INF	Mean
B_1: Vermiwash @ 10%	28.00	44.33	35.00	**35.78**	24.00	41.33	31.00^{f}	**32.11^{d}**	9.85^{h}	20.45^{b}	16.35^{ef}	**15.55^{d}**
B_2:panchagavya @ 5 %	40.33	54.00	40.33	**44.89**	36.33	52.00	37.33^{d}	**41.89^{a}**	14.14^{g}	23.14^{a}	17.81^{de}	**18.36^{a}**
B_3: *Jeevamrutha* @ 20 %	29.00	49.80	38.00	**38.93**	25.00	46.80	34.00^{ef}	**35.27^{c}**	10.99^{h}	21.03^{b}	17.04^{de}	**16.35^{c}**
B_4: Cow urine @ 10 %	32.00	53.00	41.00	**42.00**	26.00	51.00	38.00^{d}	**38.33^{b}**	11.14^{h}	22.56^{a}	18.58^{cd}	**17.43^{b}**
B_5: Water spray (control)	26.00	40.67	33.00	**33.22**	22.00	38.67	27.67^{g}	**29.44^{e}**	11.50^{h}	19.87^{bc}	15.12^{fg}	**15.50^{d}**
Mean	**31.07**	**48.36**	**37.47**		**26.67**	**45.96**	**33.60^{b}**		**11.52^{c}**	**21.41^{a}**	**16.98^{b}**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**	
A	0.68		1.90		0.64		1.76		0.47		1.30	
B	1.05		2.41		1.02		2.34		0.35		0.80	
A X B	1.70		3.77		1.63		3.62		0.75		1.75	

A_1: Natural Farming, A_2: Organic Farming, A_3: Intensification of natural farming with required organic farming practices, C_1:Recommended Package of Practices, C_2:Chemical farming

Means followed by the same letters do not differ significantly by DMRT at P=0.05

Table 8: Test weight, seed yield and halum yield of soybean as influenced by natural, organic and integrated natural farming practices and foliar application of liquid organic manures

Treatment	(Pooled data)											
→ Farming practices	Test weight (g.)				Seed yield (kg ha^{-1})				Halum yield (kg ha^{-1})			
↓ LOM's	A_1: NF	A_2: OF	A_3: INF	Mean	A_1: NF	A_2: OF	A_3: INF	Mean	A_1: NF	A_2: OF	A_3: INF	Mean
B_1: Vermiwash @ 10%	12.02	12.30	12.78	**12.37**	2436	2919	2619	**2658**	3049	4502	3801	**3784**
B_2:panchagavya @ 5 %	12.01	12.17	12.03	**12.07**	2884	3250	3049	**3061**	3448	5180	3997	**4209**
B_3: *Jeevamrutha* @ 20 %	12.51	12.15	12.08	**12.25**	2508	2917	2799	**2741**	3199	5094	3662	**3985**
B_4: Cow urine @ 10 %	12.48	12.62	12.48	**12.53**	2699	3043	2850	**2864**	3112	5063	3792	**3989**
B_5: Water spray (control)	12.65	12.34	12.65	**12.55**	2300	2753	2197	**2416**	2871	4202	3507	**3526**
Mean	**12.33**	**12.32**	**12.40**		**2566**	**2977**	**2703**		**3136**	**4808**	**3752**	
Sources of variation	**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**		**S.Em. ±**		**CD at 5 %**	
A	0.24		NS		47		130		133		370	
B	0.28		NS		73		168		82		190	
A X B	0.52		NS		51		126		151		370	

A_1: Natural Farming, A_2: Organic Farming, A_3: Intensification of natural farming with required organic farming practices, C_1:Recommended Package of Practices, C_2:Chemical farming

Means followed by the same letters do not differ significantly by DMRT at P=0.05

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