Original Research Article

Influence of Seaweed Sap and Organic Manures on Growth and Yield of Baby Corn

ABSTRACT

A field experiment was carried out during *Rabi* 2022 season at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, to study the response of Seaweed Sap and Organic Manures on Growth and Yield of Baby Corn. The treatments consists of three level of Seaweed sap (5%, 7.5% and 10%), Organic manures (FYM, Poultry manure, Vermicompost) and control. The experiment was laid out in Randomized Block Design (RBD) with ten treatments and replicated thrice. The soil of the experimental field was sandy loam with pH (8.0), EC (0.56 ds/m), Organic Carbon (0.62%), Available N (225 kg/ha), Available P (38.2 kg/ha), and Available K (240.7 kg/ha). The results showed that application of **S**eaweed sap (10%) + Vermicompost – 8.5t/ha recorded significantly higher plant height (167.58 cm), maximum dry weight (98.48 g), No. of cobs/plant (2.47), cob length (21.40 cm), Cob weight with husk (49.84 g/cob), Cob yield (11.03 t/ha) and stover yield (35.33 t/ha). Maximum gross returns (281216.67 INR/ha), net returns (216726.67 INR/ha) and Benefit Cost (B.C) ratio (3.36).

Keywords: *Baby corn, Seaweed Sap, Growth, Yield Attributes, Economics, FYM vermicompost, poultry manure.*

Introduction

"Maize (*Zea mays* L.) is the third most important cereal crop next to rice and wheat. Across the globe it is famous as queen of cereals since it possesses higher genetic yield potential among other cereal crops like rice, wheat, oat, millets *etc*. Its significance lies in the way that it is not only utilized for human consumption and animal feed but also it is utilized by the industries for the production of corn oil, corn starch *etc*. Baby corn is not a genetically dwarf maize as the name suggests it is the immature ear of normal maize. Baby corn ear are soft and consumed as vegetable by human being" (**Jinjala *et al*., 2016).** "A recent trend is of growing maize for vegetable purpose, which is commonly known as 'baby corn'. It is a small young

cob or ear or the female inflorescence before pollination or fertilization. The important attributes relevant to baby corn are early maturity, synchronized ear emergence and small palatable yellow kernels" **(Kumar and Kalloo, 1998).**

"FYM seems to act directly by increasing crop yield by acceleration of respiratory process or by cell permeability or by hormonal growth action. Under organic management, nutrients release and crop demand synchrony is very much required; hence, a thorough understanding of nutrients release pattern from organic sources is essential to avoid nutrients stress. FYM is a store house of nutrient, which contain all essential plant nutrients. It is beneficial as apply fertilizer like Zn and K in combination with FYM" (**Nawab et al., 2011**)

Poultry manure is a readily available fertilizer that works well as a substitute for chemical-based fertilizers. Exchangeable cations increase after manure application, and the amount of nitrogen in the soil rises by nearly 53% (from 0.09 to 0.14%) **Boateng *et al*. (2006**). In agriculture, using poultry manure is primarily done to provide crops with nutrients and to alter the soil organically **Warnen *et al*. (2006**). Therefore, the goal of this study was to ascertain how applying poultry manure at various rates will affect the soil's availability of phosphorus and the growth of the maize plant.

"Vermicomposting is the process of producing compost by utilizing earthworms to turn the organic waste into high-quality compost that consists mainly of worm cast in addition to decayed organic matter" (**Devi and Prakash, 2015**)

Sea weeds are marine algae, saltwater dwelling, and simple organisms that fall into the rather outdated general category of "plants". Most of them are the red (6000 species), brown (2000 species) or green (1200 species). A wide range of beneficial effects have been reported from the use of liquid seaweed extracts (**Blunden, 1991**), including increased crop yields, resistance of plants to frost, increased uptake of inorganic constituents from the soil, more resistance to stress conditions and reduction in storage losses of fruit. "Sea weeds have proved effective in enhancing yield, pest and frost resistance in vegetables, fruits, flowers, cereals and pulses. Seaweed extracts had beneficial effect on seed germination and plant growth" (**Thirumal *et al*., 2003**). The seaweeds are known to add major plant nutrients *viz*., N, P, K, Ca, Mg, S, and different micronutrients which are required for crop growth and development.

2. MATERIALS AND METHODS

This experiment was carried out during the *Rabi* season of 2022 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj (U.P.). The crop research farm is situated at 25^0 39" 42" N latitude, 81^0 67" 56" E longitude and at an altitude of 98 m above mean sea level. The experiment was laid out in Randomized Block Design consisting of ten treatments with T_1 **S**eaweed sap (5%) +FYM -15t/ha, T_2 - **S**eaweed sap (5%) + Poultry manure – 3.5t/ha, T_3 – **S**eaweed sap (5%) + Vermicompost - 8.5t/ha, T_4 - **S**eaweed sap (7.5%) + FYM -15t/ha, T_5 - **S**eaweed sap (7.5%) + Poultry manure – 3.5t/ha, T_6 - **S**eaweed sap (7.5%) + Vermicompost – 8.5t/ha, T_7 - **S**eaweed sap (10%) + FYM -15t/ha, T_8 - **S**eaweed sap (10%) + Poultry manure – 3.5t/ha, T_9 - **S**eaweed sap (10%) + Vermicompost – 8.5t/ha, T_{10} - *Control (RDF).* The soil of experimental field was sandy loam with pH (8.0), Organic carbon (0.62%), available N (225 kg/ha), available P (38.2 kg/ha), and available K (240.7 kg/ha). The crop was sown on 17th December 2022 with seed rate of 20 kg/ha. Seeds are sown at a spacing of 45 cm × 20 cm. Data recorded on different aspects of crop, *viz.*, growth parameters and yield attributes were subjected to statistical analysis by "Analysis of Variance Technique" (**Gomez and Gomez, 1976)** and economic data were analyzed by mathematical method.

RESULT AND DISCUSSION:

A. Growth parameters

Plant height (cm)

The significantly higher plant height (167.58 cm) was observed in treatment 9 with the application of **S**eaweed sap (10%) + Vermicompost – 8.5t/. However, treatment 4 with application of **S**eaweed sap (7.5%) + FYM -15t/ha, treatment 5 with application of **S**eaweed sap (7.5%) + Poultry manure – 3.5t/ha, treatment 6 with application of **S**eaweed sap (7.5%) + Vermicompost – 8.5t/ha, treatment 7 with application of **S**eaweed sap (10%) + FYM -15t/ha and treatment 8 with application of **S**eaweed sap (10%) + Poultry manure – 3.5t/ha was statistically at par with treatment 9.

"Statistical analysis did not reveal any significant difference in the plant height of sweet corn as influenced by vermicompost. Thus, in this study, it is obvious that the highest rate of vermicompost at 5 t /ha produced the highest plant height (172 cm), although statistically

in- significant". (**Villaver et al., 2020**)

The study of (**Joshi *et al.*, 2015**) revealed that vermicompost improved the plants height due to humic acid and growth promoting bacteria.

Plant Dry Weight (g/plant)

The significantly higher dry weight (98.48 g) was observed in treatment 9 with the application of **S**eaweed sap (10%) + Vermicompost – 8.5t/. However, treatment 6 with application of **S**eaweed sap (7.5%) + Vermicompost – 8.5t/ha, treatment 7 with application of **S**eaweed sap (10%) + FYM -15t/ha and treatment 8 with application of **S**eaweed sap (10%) + Poultry manure – 3.5t/ha was statistically at par with treatment 9.

(**Dadarwal *et al.* 2009**) results showed that maximum dry weight accumulation were recorded under 75% NPK from 2.25 tons vermicompost /ha. Similar result is also achieved by **(Sharma *et. al* 2014)**. Use of organic fertilizers such as vermicompost has a positive effect on crop growth, yield.

B. Yield Attributes

Number of cobs/plant

The results revealed that there was significant difference between the treatments and maximum number of cob /plant (2.47/plant) was observed in treatment 9 with application of **S**eaweed sap (10%) + Vermicompost - 8.5t/ha which was significantly superior to all the treatments. Similar findings are reported by (**Naveen *et al.* 2020**).

Cob length (cm)

The results revealed that there was significant difference between the treatments and maximum Cob length (21.40 cm) was observed in treatment 9 with application of **S**eaweed sap (10%) + Vermicompost - 8.5t/ha which was statically at par to all the treatment.

Younas *et al.* (2021) revealed that "the application of vermicompost proved the most effective improving growth and yield attributes maize crop varieties. The highest values cob length were recorded with the application of vermicompost whereas, control treatment recorded the lowest values of these traits".

Cob weight (g)

The results revealed that there was significant difference between the treatments. Maximum

Cob weight (49.84 g) was observed in treatment 9 with application of **S**eaweed sap (10%) + Vermicompost - 8.5t/ha which was statically at par to all the treatment.

"Individual cob weight in vermicompost received plots could be due to better interception, absorption and utilization of radiation energy leading to higher photosynthetic rate and finally more accumulation. The overall improvement reflected into better source- sink relationship, which in turn enhanced the yield and yield attributes" **(Madhavi *et al.*, 1995).**

Cob yield (t/ha)

The results revealed that there was significant difference between the treatments and maximum cob yield (11.03 t/ha) was observed in treatment 9 with application of **S**eaweed sap (10%) + Vermicompost - 8.5t/ha. However, treatment 6 with application of **S**eaweed sap (7.5%) + Vermicompost - 8.5t/ha were found to be statistically at par with treatment 9.

Mohammadi *et al.* (2017) reported that "the cob yield was significantly influenced by various levels of vermicompost. Significantly the highest cob yield (14.15t/ha) were recorded with the application of vermicompost at 4.00 t/ha followed by application of vermicompost at 2.00 t/ha. The increase in cob yield might be due to remarkable improvement in yield attributes. This might be due to better growth with higher nutrient supply by vermicompost and also provided nutrients for longer period and readily to use form with growth promoting substances which improve overall growth and reflected in yield".

Stover yield (t/ha)

The results revealed that there was maximum stover yield (35.33t/ha) observed in treatment 9 with application of **S**eaweed sap (10%) + Vermicompost - 8.5t/ha. Whereas, treatment 6 with application of **S**eaweed sap (7.5%) + Vermicompost - 8.5t/ha were found to be statistically at par with treatment 9.

This result was in accordance with the data recorded by **(Madhavi *et al.* 1995)**. Higher rate of nitrogen by organic manure had beneficial effect on physiological processes, plant metabolism, dry matter production, growth etc. there by leading to higher green fodder.

C. Economics

Maximum Gross Returns (INR/ha)

Maximum gross returns (2,81,216 INR/ha) was recorded in treatment T9: [**S**eaweed sap (10%) + Vermicompost - 8.5t/ha] whereas, the lowest value (1,58,166 INR/ha) was observed

in treatment T10: Control plot [(RDF 120-60-40 kg/ha)].

Net Returns (INR/ha)

Maximum net return (2,16,726 INR/ha) was recorded in treatment T9: [**S**eaweed sap (10%) + Vermicompost - 8.5t/ha] whereas, the lowest value (1,08,026 INR/ha) was observed in treatment T10: Controlplot [(RDF 120-60-40 kg/ha)].

Benefit Cost Ratio

Maximum Benefit cost ratio (3.36) was recorded in treatment T9: [**S**eaweed sap (10%) + Vermicompost - 8.5t/ha], whereas the lowest value (1.89) was observed in treatment T1: [**S**eaweed sap (5%) +FYM -15t/ha].

CONCLUSION

Based on the results, it is concluded that application of 10% seaweed sap and 8.5 t/ha of vermicompost has improved growth metrics, yield characteristics, and Benefit Cost (B:C) ratio.

Table: 1 Influence of Seaweed Sap and Organic Manures on Growth Parameters and Yield of Baby Corn.

S.No.	Treatment combinations	At 80 DAS	
		Plant height (cm)	Dry weight (g/plant)
1.	**S**eaweed sap (5%) +FYM -15t/ha	144.39	66.84
2.	**S**eaweed sap (5%) + Poultry manure – 3.5t/ha	148.78	69.83
3.	**S**eaweed sap (5%) + Vermicompost - 8.5t/ha	150.93	72.88
4.	**S**eaweed sap (7.5%) +FYM -15t/ha	156.31	78.04
5.	**S**eaweed sap (7.5%) + Poultry manure – 3.5t/ha	154.45	83.00
6.	**S**eaweed sap (7.5%) + Vermicompost - 8.5t/ha	156.83	85.58
7.	**S**eaweed sap (10%) +FYM -15t/ha	161.46	89.37
8.	**S**eaweed sap (10%) + Poultry manure – 3.5t/ha	163.11	93.41
9.	**S**eaweed sap (10%) + Vermicompost - 8.5t/ha	167.58	98.48
10.	Control (RDF 120:60:40 kg/ha)	147.20	64
	F-test	S	S
	SEm(±)	4.53	4.56
	CD (p=0.05)	13.46	13.55

Table 2 Influence of Seaweed Sap and Organic Manures on Yield Attributes and Yield of Baby Corn

S. No.	Treatment combinations	No. of cobs/plant	Cob length (cm)	Cob weight (g/cob)	Cob yield (t/ha)	Stover yield (t/ha)
1.	**S**eaweed sap (5%) +FYM -15t/ha	1.67	18.93	44.16	7.50	28.33
2.	**S**eaweed sap (5%) + Poultry manure – 3.5t/ha	1.93	19.27	44.03	8.59	30.33
3.	**S**eaweed sap (5%) + Vermicompost - 8.5t/ha	2.00	18.73	45.04	10.10	32.66
4.	**S**eaweed sap (7.5%) +FYM -15t/ha	1.73	18.80	38.81	8.73	30.33
5.	**S**eaweed sap (7.5%) + Poultry manure – 3.5t/ha	2.07	18.87	40.83	9.44	32.66
6.	**S**eaweed sap (7.5%) + Vermicompost - 8.5t/ha	2.13	19.27	48.54	10.55	33.66
7.	**S**eaweed sap (10%) +FYM -15t/ha	2.00	18.47	40.28	7.97	29.00
8.	**S**eaweed sap (10%) + Poultry manure – 3.5t/ha	2.13	18.40	42.05	9.16	32.00
9.	**S**eaweed sap (10%) + Vermicompost - 8.5t/ha	2.47	21.40	49.84	11.03	35.33
10.	Control (RDF 120:60:40 kg/ha)	1.47	18.33	37.23	6.17	25.00
	F Test	S	S	S	S	S
	SEm (±)	0.07	0.30	0.18	0.16	0.59
	CD (P=0.05)	0.22	0.90	0.54	0.48	1.78

Table 3 Effect of Seaweed Sap and Organic Manures on Economics of Baby Corn

S. No.	Treatment combinations	Cost of Cultivation (INR/ha)	Gross Returns (INR/ha)	Net Returns (INR/ha)	B:C
1.	**S**eaweed sap (5%) +FYM -15t/ha	66,240	1,91,750	1,25,510	1.89
2.	**S**eaweed sap (5%) + Poultry manure – 3.5t/ha	72,240	2,19,383.33	1,47,143.33	2.04
3.	**S**eaweed sap (5%) + Vermicompost - 8.5t/ha	63,990	2,57,483.33	1,93,493.33	3.02
4.	**S**eaweed sap (7.5%) +FYM -15t/ha	66,490	2,22,800	1,56,310	2.35
5.	**S**eaweed sap (7.5%) + Poultry manure – 3.5t/ha	72,490	2,40,983.33	1,68,493.33	2.32
6.	**S**eaweed sap (7.5%) + Vermicompost - 8.5t/ha	64,240	2,68,966.67	2,04,726.67	3.19
7.	**S**eaweed sap (10%) +FYM -15t/ha	66,740	2,03,683.33	1,36,943.33	2.05
8.	**S**eaweed sap (10%) + Poultry manure – 3.5t/ha	72,740	2,33,883.33	1,61,143.33	2.22
9.	**S**eaweed sap (10%) + Vermicompost - 8.5t/ha	64,490	2,81,216.67	2,16,726.67	3.36
10.	Control (RDF 120:60:40 kg/ha)	50,140	1,58,166.67	1,08,026.67	2.15

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