Effect of Sea weeds saps on growth yield and Economics of Sesamum

ABSTRACT:

A field experiment was conducted at Agricultural Research Station, Yelamanchili with nine treatments comprised of T1- 2.5 % K Sap + RDF, T2- 5 % K Sap + RDF, T3- 10 % K Sap + RDF, T4- 15 % K Sap + RDF, T5- 2.5 % G Sap + RDF, T6- 5 % G Sap + RDF, T7- 10 % G Sap + RDF, T8- 15 % G Sap + RDF, T9- Control only RDF (With water spray) to identify suitable sea weed sap and concentration for obtaining higher yields in sesamum. The experimental results on growth parameters like Plant height, number of branches, LAI and crop growth rate revealed that significant improvement in these parameters was observed with spraying G Sap and K-Sap at 2.5 to 15 % concentrations. The maximum values of growth parameters was recrded with 10% G Sap spraying followed by K-Sap at 10% Conc. Followed by and G-Sap and K-Sap at 5% Concentration. The number of capsules higher with 5 % K Sap + RDF followed by 10 % G Sap + RDF and 5 % G Sap + RDF. The highest sesamum yield was recorded with 10% G-sap (325 kg/ha) followed by 10% K-Sap (314 Kg/ha), which were significantly superior over rest of all other treatments. Highest gross returns, net returns and BC ratio was recorded with 10 % G Sap and 10%K-Sap. The study can be concluded as along with recommended dose of fertilizers spraying G Sap or K-Sap of sea weeds at 10 concentration is required for realizing higher seed yield and returns in seasamum.

Key words: Sea weed Extracts, G Sap, K-Sap, Seamum.

INTRODUCTION:

Sesame (*Sesamumindicum*L.) is the oldest indigenous oilseed crop of the world and commonly known as sesamum or til or gingelly, belongs to the family Pedaliaceae. Its oil content generally varies from 46 to 52 % and protein content between 20 and 26 %. It also contains substantial amounts of methionine and tryptophan, vitamin (Thiamine, Vitamin B6 and Niacine) and minerals (Fe, Mg and Ca). Seed contains two lignans, sesamin and sesmolin. Sesame oil has excellent nutritional, medicinal, cosmetic and cooking qualities for which, it is known as ‘the queen of oilseeds’. North-Coastal Andhra Pradesh is a traditional zone for sesame cultivation, especially during *rabi* in the pockets where meager water resources are available to provide a couple of irrigations. Farmers of this region usually pay little attention towards the nutritional needs of this crop due to its poor growing conditions and hence realizing very low yields.

There is growing concern that environmental pollution caused by imbalanced and indiscriminate use of chemical fertilizers and pesticides that are directly or indirectly casing health problems to human beings and animals. Consequently, there is a need for farmers shift from chemical-based conventional farming methods to organic, alternative or low input sustainable agriculture. Seaweed extracts have become increasingly popular in agriculture in this decade and emerged as a versatile tool in sustainable agriculture due to their multiple benefits in promoting plant growth, augmenting yield, enhancing soil health, improving crop resilience, and reducing reliance on synthetic agrochemicals(Booth, 1965). Seaweed extracts are organic and biodegradable bio-stimulants (Ali *et.al,*2019) which can enhance the effectiveness of conventional mineral fertilizers. Seaweed liquid extracts had gained importance as foliar spray. It acts as a source of nutrients and thereby increased the nutrient content of crops. Seaweed extracts supplies nitrogen, phosphorous, potash as well as trace minerals like Zn, Mn, Mg, Fe, etc . Its extract contains natural plant growth substances like auxins, gibberlins and cytokinins (Kapur *et.al,*2018). The trace elements present in seaweed extract are in naturally chelated form and are readily available to plants. It accelerates photosynthesis and further develops healthy foliage. Foliar spraying of seaweed sap to crops, vegetables, trees increased growth, grain and yield of plants. Application of seaweed extract, Kappaphycus alvarezii and Gracilaria spp. along with recommended dose of fertilizer improves growth and quality of sugarcane, rice, soybean and green gram. Shankar *et al.* (2015) reported the effect of seaweed liquid fertilizers obtained from Kappaphycus extract (K) and Gracilaria extract (G) onSesamum. In pre-kharif sesame the seaweed extracts are effective in increasing the growth parameters, yield, economics and quality of sesame(Shankar *et al,* 2020). Therefore it is essential to explore the extent of applicability of seaweeds extract in organic farming techniques

MATERIAL AND METHODS:

The field experiment was sown during two consecutive Kharif seasons at ARS, Yelamanchili with YLM -11 variety. The field experiment was laid out in a randomized block design with three replications and Nine treatments. The soil of experimental site was sandy loam in texture, medium alkaline in reaction (pH: 6.80), non-saline (EC: 0.17 dS m -1), low in organic carbon (0.5%), low in available nitrogen (282 kg ha -1), low in available phosphorus (21.2 kg P 2 O 5 ha -1) and available potassium is (396 kg K 2 O ha -1). The treatments comprised of T1- 2.5 % K Sap + RDF, T2- 5 % K Sap + RDF, T3- 10 % K Sap + RDF, T4- 15 % K Sap + RDF, T5- 2.5 % G Sap + RDF, T6- 5 % G Sap + RDF, T7- 10 % G Sap + RDF, T8- 15 % G Sap + RDF, T9- Control only RDF (With water spray).First spray of 5% solution was given at 35 DAS , second at 13 days and 14 days after the first and second spray. The crop was given with recommended dose of fertilizers and with all package of practices. Plant height was measured from ground level to the tip of the growing point at the time of harvest and expressed in centimeters (cm). Growth parameters like CGR and LAI was recorded at peak growth stages of the crop to know the effect of sea weed saps. All the parameters pertaining to yield like number of branches, number of capsules and seed yield were recorded and the two years data was pooled and the replicated data was statistically analyzed as per the procedure suggested by Gomez and Gomez (1984) for combined analysis of randomized complete block design over years and treatment means were compared at LSD p=0.05. The crop was harvested at complete maturity stage and the seed was well dried before recording of weight. Economics of the various sea weed saps was calculated considering the cost of all cultivation practices during respective years.

RESULTS AND DISCUSSION:

The observations on plant height revealed that significant improvement was observed with sp[raying both in K-Sap and G-Sap @10% and 5% concentrations. The plant height was highest with 10 % G Sap + RDF (120.56 cms), however it was found on par to 10 % K Sap + RDF, 5 % G Sap + RDF and 5 % K Sap + RDF . Lowest plant height was recorded with water spray. Regarding the number of branches,the highest number was recorded with G-Sap 10% solution+RDF (5.73), this is at par with 10% K-Sap and 5 % K Sap + RDF. Crop Growth rate and Leaf Area Index was also maximum with 10 % G Sap + RDF followed by 10 % K Sap + RDF , 5 % G Sap + RDF and 5 % K Sap + RDF. Better nutrient availability as per the crop needs might have resulted in elevated growth stature of sesamum. In all the growth parameters lowest values was recorded in water spray followed by spraying K-Sap and G-sap at 2.5 % and 15 % concentrations Similar results were reported by earlier researchers Layak *et, al.*2016 in Maize and Shankar *et al,* 2015 in sesamum.

The observations on yield parameters revealed that, the number of capsules were higher with 5 % K Sap + RDF followed by 10 % G Sap + RDF and 5 % G Sap + RDF. The number of capsules were lowest with water spray followed by 15 % K Sap + RDF. Significant yield increase was observed by spraying both G-sap and K-Sap from 2.5% to 15% concentations. The highest sesamum yield was recorded with 10% G-sap+RDF (325 kg/ha) followed by 10% K-Sap+RDF (314 Kg/ha), which were significantly superior over rest of all other treatments. Combined application of seaweed extracts along with fertilizers was mainly responsible for improved growth attributes like crop growth rate during the vital period of seed filling that result in greater number of capsules per plant, seeds per capsules and higher test weight and ultimately increased seed yield over water + RDF was recorded as the lowest. Presence of micro-elements and plant growth regulators hormones in Kappaphycus and Gracilaria extracts is probably responsible for the increased yield and improved nutrition of sesame receiving through foliar application of the extract (Shankar et al, 2020). After 10% next best concentration was 15% of both G-sap and K-Sap whereas 2.5% concentration of both G-sap and K-Sap was found inferior but significantly higher over water spray. Similar results of spraying the G- sap at 10% conc. recorded highest yield and yield parameters in Blackgram by Ramamoothy *et, al* (2006) in wheat by Zodape *et, al* (2009) and in greengram by Zodape *et, al* (2010).

From the data the most economic feasible spray solution can be worked out by incorporating the yield data with the cost of cultivation and cost of treatment. Highest gross returns, net returns and BC ratio was recorded with 10 % G Sap + RDF ,which was at par with K-Sap 10% .The BC ratio values in both the saps at 5% recorded at par in G-sap and in K-sap. Application of seaweed extract along with 100% recommended dose of fertilizers higher gross return, net returns and return per rupees invested from prekharif sesame cultivation also reported earlier by Shankar *et al,* 2020.

CONCLUSION

Sea weed saps are most economical and viable option to increase growth and yield of the crops. The study can be concluded as along with recommended dose of fertilizers, spraying G Sap or K-Sap of sea weeds at 10% concentration is required for realizing higher seed yield and returns in seasamum.

Table.1 Effect of sea weed saps on Plant height, Number of branches, Number of capsules and seed yield of Sesamum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatments | Plant height | No. of Branches per plant | No. of capsules per plant | Seed yield  ( Kg ha-1) |
| T1- 2.5 % K Sap + RDF | 103.71 | 4.83 | 67.33 | 220.26 |
| T2- 5 % K Sap + RDF | 119.36 | 5.16 | 73.53 | 288.0 |
| T3- 10 % K Sap + RDF | 120.15 | 5.46 | 66.28 | 314.72 |
| T4- 15 % K Sap + RDF | 110.06 | 4.33 | 54.61 | 250.3 |
| T5- 2.5 % G Sap + RDF | 110.33 | 4.2 | 58.13 | 233.07 |
| T6- 5 % G Sap + RDF | 120.55 | 4.96 | 72.40 | 292.75 |
| T7- 10 % G Sap + RDF | 120.56 | 5.73 | 73.09 | 325.08 |
| T8- 15 % G Sap + RDF | 107.75 | 4.26 | 61.21 | 237.37 |
| T9- Control only RDF (With water spray) | 104.1 | 3.85 | 43.06 | 208.25 |
| Sem + | 1.10 | 0.22 | 0.62 | 2.82 |
| CD (P=0.05%) | 3.31 | 0.67 | 1.85 | 8.45 |

Table.2 Effect of sea weed saps on Crop growth rate and Leaf area index of sesamum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatments | CGR (gm-2day-2) for 15 days | CGR (gm-2day-2) for 15-30 days | LAI at 36 DAS | LAI at 48 DAS |
| T1- 2.5 % K Sap + RDF | 2.27 | 3.95 | 8.57 | 19.09 |
| T2- 5 % K Sap + RDF | 3.29 | 5.22 | 12.65 | 26.10 |
| T3- 10 % K Sap + RDF | 3.98 | 5.81 | 14.94 | 28.27 |
| T4- 15 % K Sap + RDF | 2.48 | 4.54 | 9.89 | 20.99 |
| T5- 2.5 % G Sap + RDF | 2.47 | 4.61 | 9.48 | 21.61 |
| T6- 5 % G Sap + RDF | 3.67 | 5.26 | 13.79 | 26.74 |
| T7- 10 % G Sap + RDF | 4.01 | 6.04 | 15.89 | 29.07 |
| T8- 15 % G Sap + RDF | 2.55 | 4.49 | 10.0 | 21.25 |
| T9- Control only RDF (With water spray) | 2.11 | 2.77 | 7.81 | 16.89 |
| Sem + | 0.17 | 0.22 | 0.24 | 0.40 |
| CD (P=0.05%) | 0.5 | 0.65 | 0.73 | 1.21 |

Table.3 Effect of sea weed saps on gross returns, net returns and BC ratio of Sesamum

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Treatments | Cost of cultivation  (Rs.ha-1) | Gross returns (Rs.ha-1) | Net returns (Rs.ha-1) | BC ratio |
| T1- 2.5 % K Sap + RDF | 13688 | 19800 | 6113 | 1.44 |
| T2- 5 % K Sap + RDF | 14250 | 25920 | 11670 | 1.81 |
| T3- 10 % K Sap + RDF | 14813 | 28350 | 13538 | 1.91 |
| T4- 15 % K Sap + RDF | 15375 | 22500 | 7125 | 1.46 |
| T5- 2.5 % G Sap + RDF | 13688 | 20970 | 7283 | 1.53 |
| T6- 5 % G Sap + RDF | 14250 | 26370 | 12120 | 1.85 |
| T7- 10 % G Sap + RDF | 14813 | 29250 | 14438 | 1.97 |
| T8- 15 % G Sap + RDF | 15375 | 21330 | 5955 | 1.38 |
| T9- Control only RDF (With water spray) | 13125 | 18720 | 5595 | 1.42 |
| Sem + | 325 | 564 | 239 | 0.12 |
| CD (P=0.05%) | 975 | 1690 | 718 | 0.37 |

REFERENCES

Ali, O Ramsubhag, A.Jayaraman, J. Biostimulatory, 2019. Activities of  *Ascophyllum nodosum* Extract in Tomato and Sweet Pepper Crops in a Tropical Environment. *PLoS ONE* *14*, e0216710.

Booth, E. 1965. The manufacture and properties of liquid seaweed extracts. In: Blunden, g. (ed) proceedings of the sixth international seaweed symposium, Tokyo, 1965, 655-662.

Gomez KA and Gomez AA. 1984. Statistical Procedures for Agricultural Research. John Wiley & Sons, New York.

Kapur, B. Sarıdaş, M.A. Çeliktopuz, E. Kafkas, E.;Paydaş Kargı, S. 2018.Health and Taste Related Compounds in Strawberries under Various Irrigation Regimes and Bio-Stimulant Application. *Food Chem.* .

Layek J, Das A, Ramkrushna GI, Ghosh A, Panwar AS, Krishnappa R, Ngachan SV.,2016. Effect of seaweed sap on germination, growth and productivity of maize (Zea mays) in North Eastern Himalayas. Indian J. Agron.,; 61:354-359.

Ramamoorthy, K., Sujatha, K., Sivasubramaniam, K. and Subburamu, K. 2006.Utilisation of seaweed extract for enhancing yield in black gram Vignamungo L. Seaweed Res. Utiln., 29: 97-100.

Tanmoy Shankar1\*, G. C. Malik1 , M. Banerjee1 and A. Ghosh,2015. Effect of Sea Weed Extracts on the Growth, Yield Attribute and Nutrient Uptake of Sesame (Sesamum indicum L.) International Journal of Bio-resource and Stress Management. 6(3):420-423.

Tanmoy Shankar, G.C. Malik , M. Banerjee  and A. Ghosh,2020. Influence of Sea Weeds Extracts on the Growth, Quality and Productivity of Sesame (Sesamum indicum) in the Red and Lateritic Belt of West Bengal. International Journal of Bioresource Science. 7(1): 05-09.

Zodape, S.T., Mukherjee, S., Reddy, M. P. and Chaudhary, D. R. 2009. Effect of Kappaphycusalvarezii (Doty) Doty ex silva extract on grain quality, yield and some yield components of wheat (Triticumaestivum L.), Intl. J. Plant Prod., 3 (2): 97-101.

Zodape ST, Mukhopadhayay S, Eshwaran K, Reddy MP, Chakara J. 2010. Enhancement of yield and nutritional quality in green gram treated with seaweed Kappaphycusalvarezii. Journal of Scientific and industrial research.; 69 (1):468-471.