The Pharma Innovation Journal 2023; 12(12): 854-859

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(12): 854-859

www.thepharmajournal.com
Received: 17-09-2023
Accepted: 27-10-2023

K Sujatha
Professor and Head, Department of Seed Science and Technology Agricultural College and research Institute, Madurai, Tamil Nadu, India

K Senthil
Professor, Department of Agricultural Chemicals, Anbil Dharmalingam College and Research Institute, Trichy, Tamil Nadu, India

Corresponding Author:
K Senthil
Professor, Department of Agricultural Chemicals, Anbil Dharmalingam College and Research Institute, Trichy, Tamil Nadu, India

Influence of seaweed based seed coating on physiological and biochemical attributes in paddy and maize

K Sujatha and K Senthil

Abstract
Laboratory experiment was conducted during 2023 to determine the effect of seaweed based seed coating on physiological and biochemical attributes of paddy and maize. Seeds were coated with different treatments *viz*., T1-control, T2- Water extract of sargassum, T3- Methanol extract of sargassum, T4- water extract of Kappaphycus, T5- Methanol extract of Kappaphycus, T6- Methanol extracts of Sargassum + Kappaphycus along with acacia gum. The physiological quality and biochemical parameters revealed that, methanol extract of sargassum seed coating registered higher germination, root length, shoot length, dry weight, vigour index, dehydrogenase activity and lower electrical conductivity.

Keywords: Sargassum, Kappaphycus, physiological quality, Paddy and Maize

Introduction
Seed enhancement is a functional seed treatment that includes seed priming and seed coating to protect the seeds in terms of physical, physiological and other pathogenic factors and allowing them to perform well in various circumstances (Halmer *et al.*, 2006) [4]. In agriculture, seed coating is the practice of covering seeds with different materials to safeguard them from environmental challenges, and increase their overall effectiveness during planting and the early growth phases. Coating seeds with chemicals poses a major threat to organic agriculture (Rathinapriya *et al.*, 2020) [10]. Seed coating is a mechanism of providing plant growth promoting substances with seeds and improve seed quality (Rocha *et al.*, 2019) [11]. Seed coating serves several purposes, such as enhancing seed protection, improving germination rates, providing essential nutrients to the emerging seedlings, and aiding in the overall establishment and growth of plants.
Seaweeds are an alternative to the chemical fertilizer. Seaweeds are multicellular marine algae predominantly found in coastal areas of seawater. They are broadly classified into three main types green seaweed (Chlorophyta), brown seaweed (Phaeophyta) and red seaweed (Rhodophyta). Brown seaweeds such as *Sargassum spp*. are commonly used seaweed in agriculture as a source of organic matter to enhance soil fertility (Baweja *et al.*, 2019) [3]. Numerous studies have found that applying seaweed extract to plants has a wide range of advantageous effects, such as promoting early germination and establishment, increasing crop performance and yield, enhancing resistance to biotic and abiotic stresses, and extending the post-harvest shelf life of perishable goods (Norrie and Keathley, 2005) [7]. Seaweed-based seed coatings are gaining popularity in agriculture due to the potential benefits they offer to the plants. These coatings often contain seaweed extracts rich in various bioactive compounds, such as plant hormones, vitamins, minerals, and polysaccharides
Since quality of seed plays an important role in biomass as well as seed production of agricultural crops, the present investigation was carried out to study the influence of seaweed based seed coating on physiological quality of paddy and maize

Materials and Methods
Collection
The marine species brown algae *Sargassum myriocystum* and red algae *Kappaphycus alvarezii* were collected from Mandapam coast, Tamil Nadu

Processing

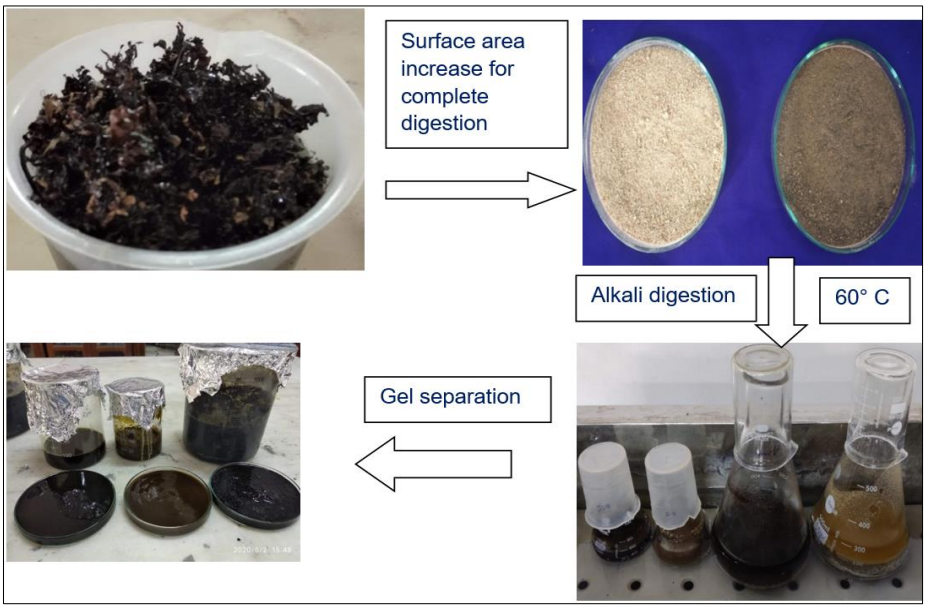
The Seaweeds (Brown and red algae) were collected, washed with seawater initially to remove macroscopic epiphytes and sand particles finally with fresh water to remove adhering salt then shade dried for 4 - 5 days followed by hot air oven @ 50º ± ºC to reduce moisture content of <8%.

Pulverizing

- The seaweed was pulverized in willey mill to get the fine powder to increase surface area for better digestion. The controlled digestion with alkali for 6 h in water bath at 60º C and then evaporated under open condition. Methanol and water was added in the evaporated material and separately kept in overnight. The final gel has been obtained after filtration.

Bio coating formulation

Methodology: A total quantity of one kg of each crops *viz*., paddy and maize seeds were taken. Seeds were coated with polymer with Sargassum and Kappaphycus and also combination of Sargassum + Kappaphycus seaweed gel was added then shade dried under shade for about 24 h.



Seed coating formulation

Graded seeds of paddy and maize coated with *Sargassum myriocystum* and *Kappaphycus alvarezii* methanol and water extracts @ of 10 ml / kg for paddy and 12 ml / kg for maize along with acacia gum (8 ml /kg). Coated seeds were shade dried to original moisture content. Coated seeds were subjected to germination test in paper medium in quadruplicate using 100 seeds for each treatment with four replicates of 25 seeds (ISTA, 1999) [5] and kept in a germination room maintained at 25 ± 1 ºC and RH 96 ± 2% with diffused light (Approx.10h) during the day. Final count on normal seedlings was recorded on 12 and 7th day for paddy and maize respectively and speed of germination, percentage germination, dry matter and vigour index was computed. The untreated seeds used as control and biochemical attributes such as electrical conductivity (dsm-1) and dehydrogenase (Kittock and Law, 1968) [6]. Statistical analysis (ANOVA) was made using AGRESS soft-ware.

Results and Discussion

Significant results were obtained due to seaweed seed coating for all the evaluated parameters.

Among the treatments, T3 recorded significantly higher germination (88%) in paddy and 100% in maize compared to other coating treatments. The improvement in germination may be due to presence of growth promoting substances such as phyto hormones and micro nutrients

(Dania Andrea *et al*., 2019 and hydrolytic enzymes (Navaro-Lopez *et al*., 2020) [11, 10]. Root length (14.65 cm) in paddy and 17.9 cm in maize and shoot length (8.45 cm) and 18.5 cm in paddy and maize respectively showed significant variations in the T_3 treatment. The control (T_1) seeds recorded root length 9.30 cm in paddy and 14.6 cm in maize and shoot length 4.91 cm and 12.8 cm in paddy and maize respectively (Fig 1 and 3). The increase in seedling length may be due to presence of "P" and it proliferates root development, thereby plants absorb nutrients from the deeper layer of soil leading to over all plant growth development (Plate 1).

Irrespective of the treatments dry weight and vigour index showed better performance in T_3 treatment. The treatment methanol extract of sargassum seed coating registered in higher dry weight (0.148 g / 10 seedlings) and vigour index

(2033) in paddy.

In case of maize T_3 treatment recorded more dry weight (0.127 g 10 seedlings) and vigour index (3640). The control seeds found that lower dry weight (0.127 g/10 seedlings) for paddy and (0.593 g / 10 seedlings) for maize and vigour index (1137) for paddy and (2192) for maize (Fig 2 and 4).The increased dry weight may be due to synthesis and activity of hydrolytic enzymes during the early phases of germination and effective mobilization of the available food reserves in the seeds resulted the increased seedling growth and dry matter production and improved the seedling vigour. Seaweeds contain essential nutrients and trace elements which perform more photosynthesis leading to an increase in dry matter production and vigour index (Ali O *et al*., 2021) [1].

The enzyme activity dehydrogenase registered better performance in T3 treatment in both paddy (0.387) and maize (0.401). The control seeds registered lower enzyme activity in paddy (0.291) and maize (0.325). The electrical conductivity was lower in T3 treatment in both paddy (0.36 dsm-1) and maize (0.36 dsm-1). The control seeds observed that higher electrical conductivity (0.42 dsm-1) in paddy and 0.45 dsm-1 in maize (Fig 5 and 6). The beneficial effect of seaweed might be due to the presence of antioxidants and growth promoting substances. Antioxidant plays a major role in counteraction of lipid per oxidation, reduction of free radical reaction and repair of damage to vital organelles. The antioxidant property of seaweeds might be slowed down the process of deterioration with higher enzyme activity. Patra *el al*., 2008 [8] and Ambika and Sujatha 2017 [2] reported that methanol extract of sargassum sp. protecting cells against ROS by act as antioxidant. Results were conformity with Ramamoorthy *et al*. (2006) [9] and Sujatha *et al.*, 2013 [12].

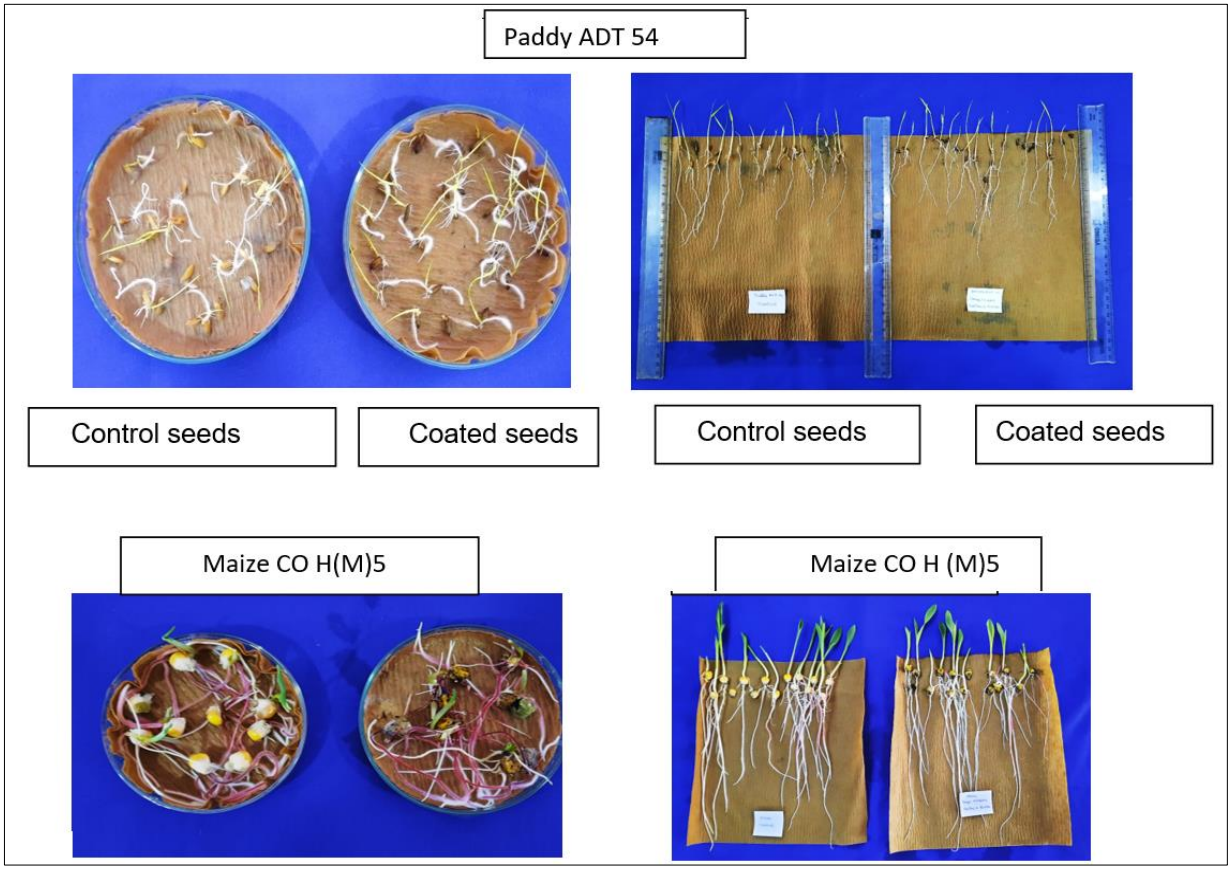


Plate 1: Effect of seaweed coating on seedling vigour in paddy and maize

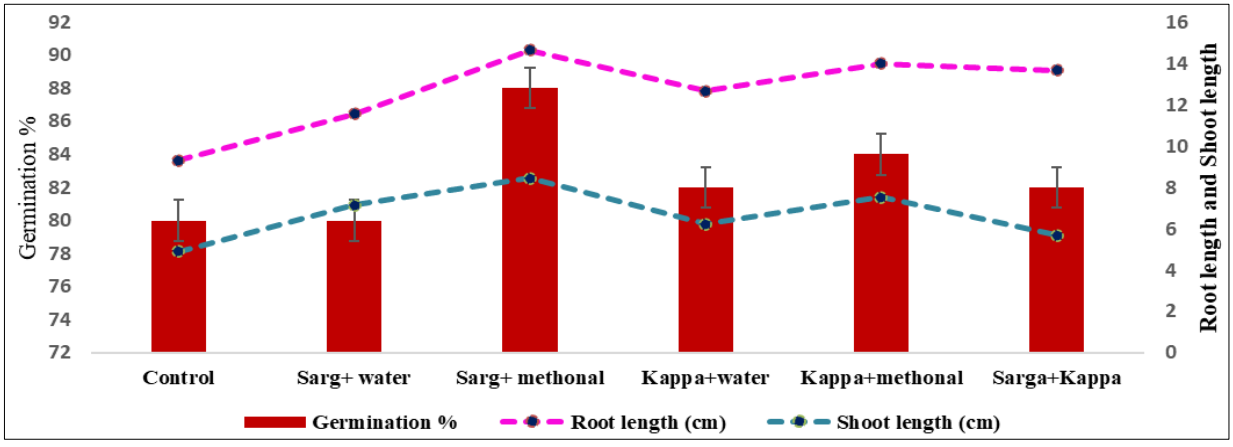


Fig 1: Effect of seaweed seed coating on Germination %, root length and shoot length in Paddy var. ADT 54

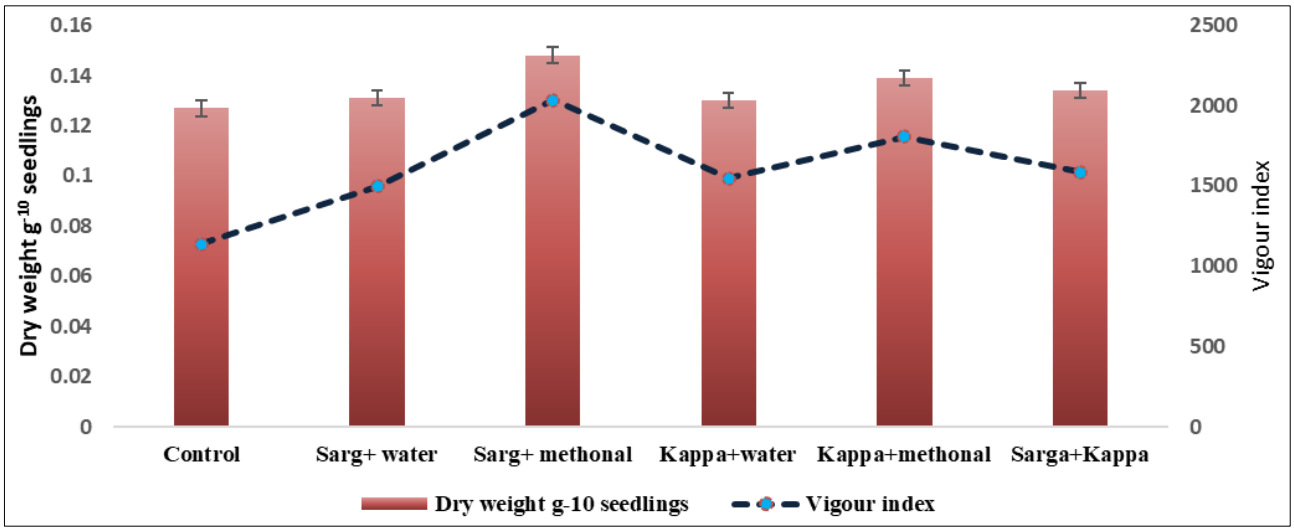


Fig 2: Effect of seaweed seed coating on dry weight and vigour index in Paddy var. ADT 54

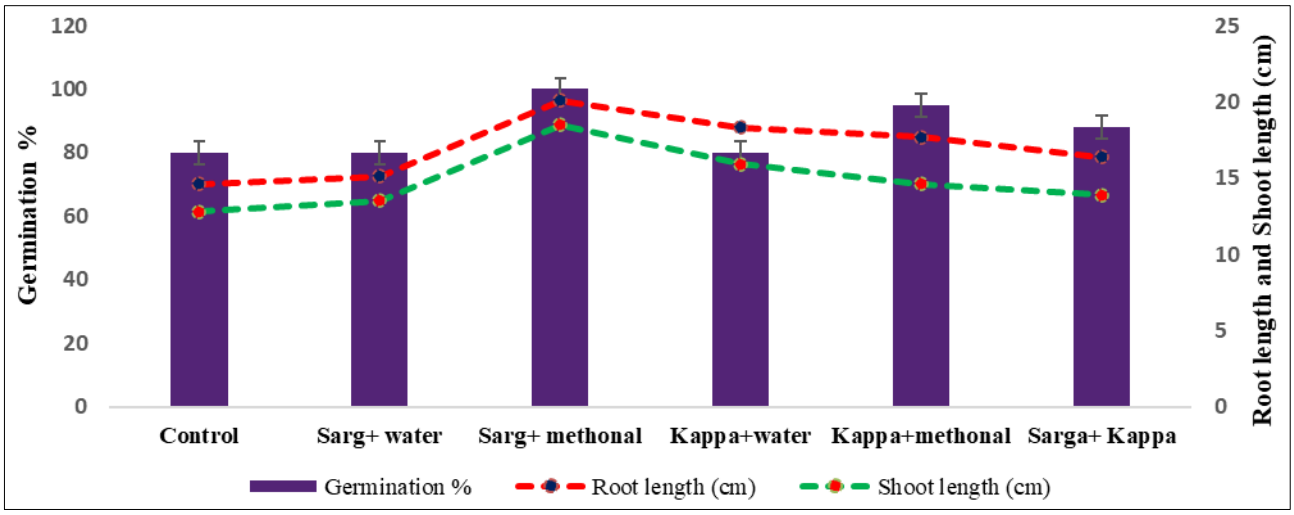


Fig 3: Effect of seaweed seed coating on germination%, root length and shoot length in Maize var. CO(H)M5

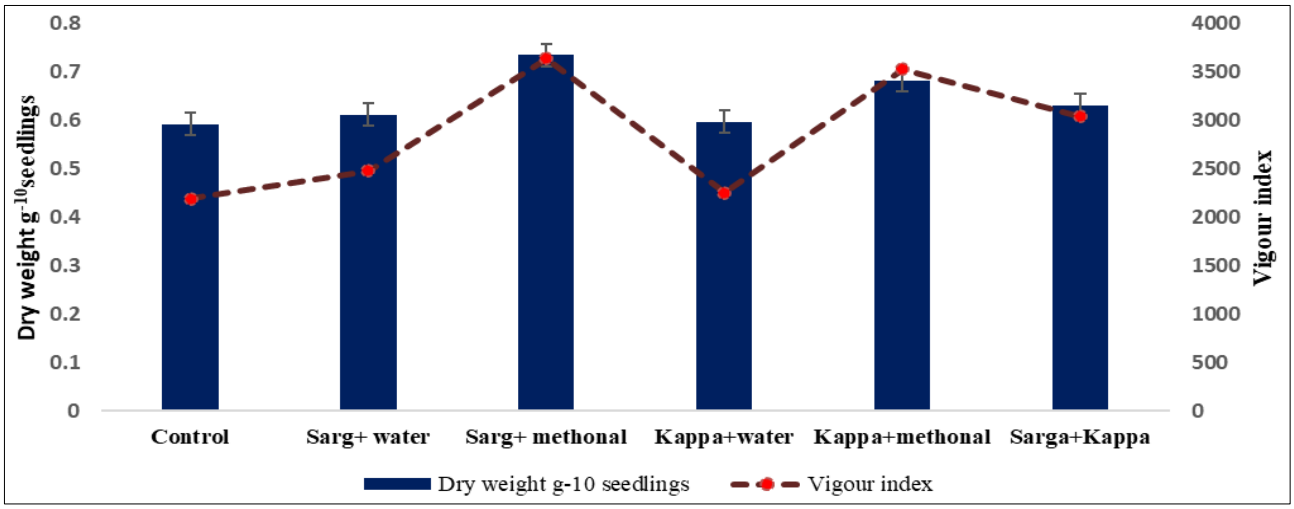


Fig 4: Effect of seaweed seed coating on dry weight and vigour index in Maize var. CO(H)M5

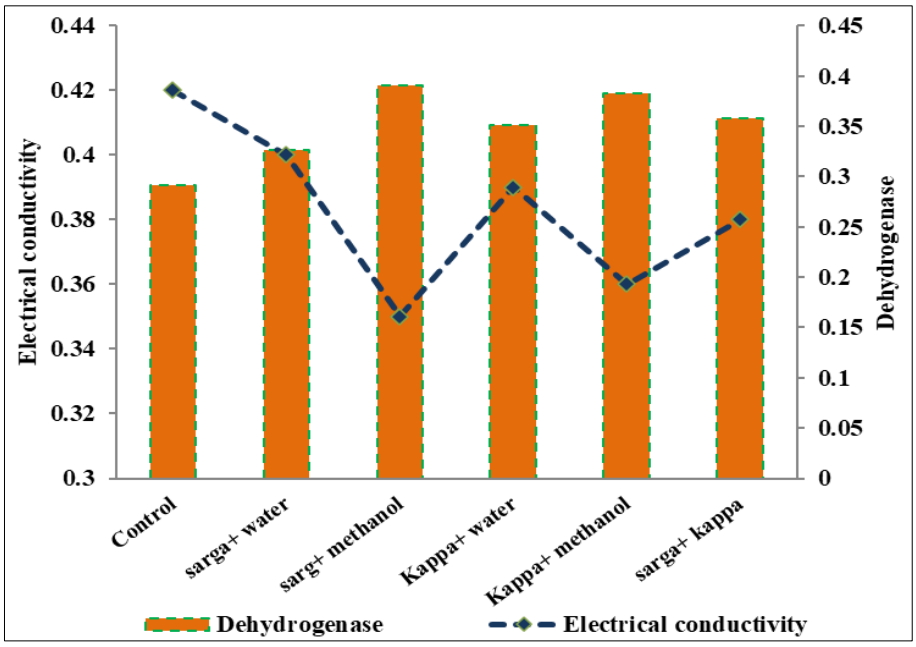


Fig 5: Effect of seaweed seed coating on Electrical conductivity (dsm-1) and Dehydrogenase in Paddy var. ADT 54

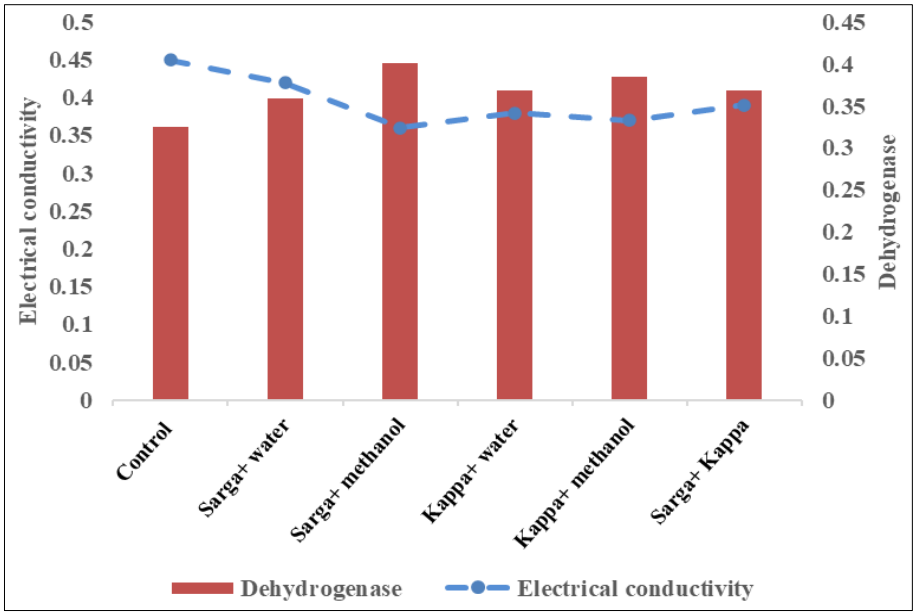


Fig 6: Effect of seaweed seed coating on Electrical conductivity (dsm-1) and Dehydrogenase in Maize var. CO(H)M5

Conclusion

It could be concluded that, seed coated with methanol extract of *Sargassum myriocystum* recorded better performance in terms of physiological and biochemical parameters in paddy and maize.

Acknowledgement

Researchers express gratitude for Tamil Nadu Agricultural University for carryout the research at Department of Seed Science and Technology, Agricultural College and Research Institute, Madurai-625104.

References

1. Ali O. Ramsubhag A and Jayaraman J. "Biostimulant properties of seaweed extracts in plants: Implications towards sustainable crop production." Plants 2021;10(3):531.
2. Ambika S, Sujatha K. Organic seaweed nano powder effect on growth and yield attributes of pigeonpea. Legume Research-An International Journal. 2017;40(4):731-734.
3. Baweja P, Kumar S, Kumar G. Organic fertilizer from algae: a novel approach towards sustainable agriculture. Biofertilizers for sustainable agriculture and environment; c2019. p. 353-370.
4. Halmer P. Seed technology and seed enhancement. XXVII International Horticultural Congress-IHC2006: International Symposium on Seed Enhancement and Seedling Production; c2006. p. 771.
5. ISTA. International Rules for Seed Testing, International Seed Testing Association, Switzerland 1999.
6. Kittock DL, Law AG. Relationship of seedling vigour, respiration and tetrazolium chloride reduction by germination of wheat seeds, Agron J. 1968;60(3):286-

288.
7. Norrie J, Keathley JP. Benefits of *Ascophyllum nodosum* marine-plant extract applications to Thompson Seedless grape production. X International Symposium on Plant Bioregulators in Fruit Production; c2005. p. 727.
8. Patra JK, Rath SK, Karmabeer Jena, Vijaya Kumar Rathod, Hrudayanath Thatoi. Evaluation of antioxidant and antimicrobial activity of seaweed (*Sargassum* sp.) extract: A study on inhibition of Glutathione-S-Transferase activity. Turkish Journal of Biology. 2008;32(2):119-125.
9. Ramamoorthy K, Sujatha K, Sivasubramanium K, Subburamu K. Organic priming with *Sargassum polycystum* extract on vigour and viability in cowpea *Vigna unguiculata* L. Walp. Seaweed Res. Utiln. 2006;28(1):85-88.
10. Rathinapriya P, Satish L, Pandian S, Rameshkumar R, Balasangeetha M, Rakkammal K, *et al*. Effects of liquid seaweed extracts in improving the agronomic performance of foxtail millet. Journal of plant nutrition 2020;43(19):2857-2875.
11. Rocha I, Duarte I, Ma Y, Souza-Alonso P, Látr A, Vosátka M, *et al*. Seed coating with arbuscular mycorrhizal fungi for improved field production of chickpea. Agronomy. 2019;9(8):471.
12. Sujatha K, Vijyalakshmi V, Thirumalai Kannan S. Studies on *Sargassum myriocystum* seaweed on seed quality and biochemical attributes in sesame cv. TMV 3. (*Sesamum indicum* L.). Research Journal of Seed Science. 2013;6(1):24-28.