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Comparison of Effects of Alum Sludge-Bound Seaweed Bio-Stimulant and Bentonite Clay-Bound Seaweed Bio-Stimulant on Seed Germination of Radish (*Raphunus Sativus* L.)

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Abstract

The marine algal seaweed and its extracts have been widely utilized as bio-stimulants in cultivation systems. They contain a lot of macronutrients (N, P, K), micronutrients (Mn, Zn, I), and bio-stimulants such as cytokinin, gibberellin, auxin, abscisic acid, and betaines. The application of these seaweeds bound by a binding material may increase its application possibility while slowly providing necessary nutrients to the plant media. The present study was conducted to characterize commercially available seaweed pellets and pellets produced by locally available seaweed variety (*Kappaphycus rhodophyta*) using alum sludge as a binding agent and to compare the effects of these pellets on seed germination bioassay of *Raphanus sativus* L. Four dilution series (100%, 75%, 50%, 25%) of aqueous extracts were obtained by extracting the pelleted bio-stimulants on 1:10 W/V basis. Distilled water was considered as the control treatment. Each treatment was replicated three times and arranged in a complete randomized design (CRD). *R. sativus* L. seeds were placed in Petri dishes, and 3 mL of aqueous extracts were added according to the treatment allowing seeds to germinate for 72 hours in a dark place. Relative Seed Germination % (RSG%), Relative Radicle Growth% (RRG%), and Germination Index (GI) were calculated for the aqueous extract series of each pellet. In locally manufactured bio-stimulants, the highest GI was obtained in 75% aqueous extract (210.6), and commercial bio-stimulants showed the highest GI in 50% aqueous extract (168.5). Accordingly, there were no phytotoxic effects in both pelleted seaweed bio-stimulants and their dilution series on *R. sativus* L. seed germination. Compared to the commercial bio-stimulant, the alum sludge-bound seaweed bio-stimulant obtained the highest germination. Also, the characterization results of pellets showed that organic matter is significantly high in alum sludge-bound seaweed pellets (29.9%) compared to commercial pellets. Furthermore, it showed that the total N, NO_3^--N, available P and K were highest in alum sludge-bound seaweed pellets. Further studies are needed to obtain the applicability and effectiveness of the new pelleted product for crop growth and yield performances.

***Keywords**:* Alum sludge, Bio-stimulant, Binding material, Pellets, Seaweed