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EFFECT OF BARK EXTRACTS OF MANGROVE ON SEED GERMINATION OF AMARANTHUS PANICULATUS AND ORYZA SATIVA VARIETIES

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ABSTRACT:-

The present study evaluates the biotonic potential of aqueous extract of mangrove bark of Avicennia officinalis L. (stem), Rhizophora mucronata Poir (proproot and stem) and Sonneratia alba J. Smith (stem) on seed germination of Amaranthus panniculatus and Oryza sativa varieties Ratnagiri-1, Ratnagiri-24 and Ratnagiri-711. The lower concentration of barks stimulated the seed germination, seedling growth and vigour index. The phytochemical bioactive compounds present in the mangrove bark will prove beneficial for formulation of chemical free botanicals.

KEY WORDS: *Amaranthus, bark, mangrove, Oryza sativa.*

INTRODUCTION:

Mangroves are found in the inter-tidal areas and estuary mouths between land and sea, mangroves provide critical habitat for a diverse marine and terrestrial flora and fauna. They are consisting of trees, shrubs, palms, epiphytes, grasses etc. Due to tremendous increase in population from last two decades there is a need to produce more yields per field. According to, Pimentel and Leviton, 1986 agrochemicals or pesticides used for maximum crop production reaches up to the targeted pest is only 0.1% and remaining 99.9% residues remains in plant parts which cause hazardous effect on human health with consumption of these foods. Bewley and Black (1994) observed that due to uptake of water from micropyle the wetted viable seed starts respiration,protein synthesis and other metabolic activities. Due to cell division and cell elongation radical emerges out and seed germination occurs. Rice (1995) studied the effect of plant extract on plants, his results indicated that effect of one plant or microorganisms show stimulatory or inhibitory effect, due to the release of bioactive compounds present in the plant. In natural environment, such type of interactions occurs. The bioactive compounds often called as allelopathics, allelocompounds or allelochemicals. Molisch (1937) termed this phenomenon as allelopathy therefore; the use of biotonics is one of the safe alternatives to overcome these chemicals which pollute our environment. Therefore, the present study was carried out to determine ameliorative the effect of biotonic on seed germination of *Amaranthus* and different rice varieties.

MATERIAL AND METHOD:

The outer barks of mangroves were collected in the month of December 2011 from the estuaries of Ratnagiriand Sindhudurga. The bark was washed thoroughly with water and blot with blotting paper. First

dry under shade and then in oven at 60^0C . Ground the bark in magnetic grinder and stored in air tiet container. The certified rice seeds of varieties of Ratnagiri-1, Ratnagiri-24 and Ratnagiri-711 were collected from agricultural Institute while *Amaranthus* seeds were collected from the local market.

Preparation of Aqueous Extract (AE) of mangrove bark:

For the preparation of Aqueous Extract the method of Oyerind (2009) was followed. 20g powder of bark was soaked in 200ml Distilled water in a beaker for 24 hours. The solution was filtered through then with Whatman's No. 1 filter paper. This filtrate served as stock of Aqueous Extract (AE) .The various concentrations (0.025%, 0.05%, 0.1%, 0.25%, 0. 5%, 1%, 1.25% and 2.5% of the stock were prepared and used for seed germination studies. Distilled water was used as a control.

Germination Studies:

The seeds of *A*maranthus and rice were surface sterilized by soaking in 0.1% $HgCl_2$, for 5 min. then in running water and finally washed in distilled water. Twenty five healthy seeds of test crop were randomly selected and placed in each cleaned, autoclave sterilized petridishes which have been lined with germinating paper. Petriplates provided with AE various concentrations with 10 ml of extract. The petriplates were incubated at room temperature (27 ± 2^0C) in dark for five days. Emergence of radical is used as the criterion for germination. Germination of seeds per day Observed up to five days. After 5 days, the root length, shoot length, fresh weight of plants were measured. Material was kept for drying in Oven. After some days, constant weight of material was taken as dry weight. The difference between fresh and dry weight is termed as Miosture Content.

Vigour index (VI) was calculated by using the formula proposed by Abdul-Baki and Andersion (1973).

VI = (Root length + Shoot length) x Germination percentage

RESULT AND DISCUSSION

Leubner (2000) reported this emergence of radical as complition of germination. Effect of bark extract of mangroves on seedling vigour of *A. paniculatus* is shown in the **fig.1** it is observed that the seedling vigour index of *A. paniculatus* is elevated due to *A. officinalis* 0.5% stem extract, *R. mucronata* 1.25% root extract and 0.05% stem extract while stem bark extract of *S. alba* significantly elevated seedling vigour at 0.1% concentration.

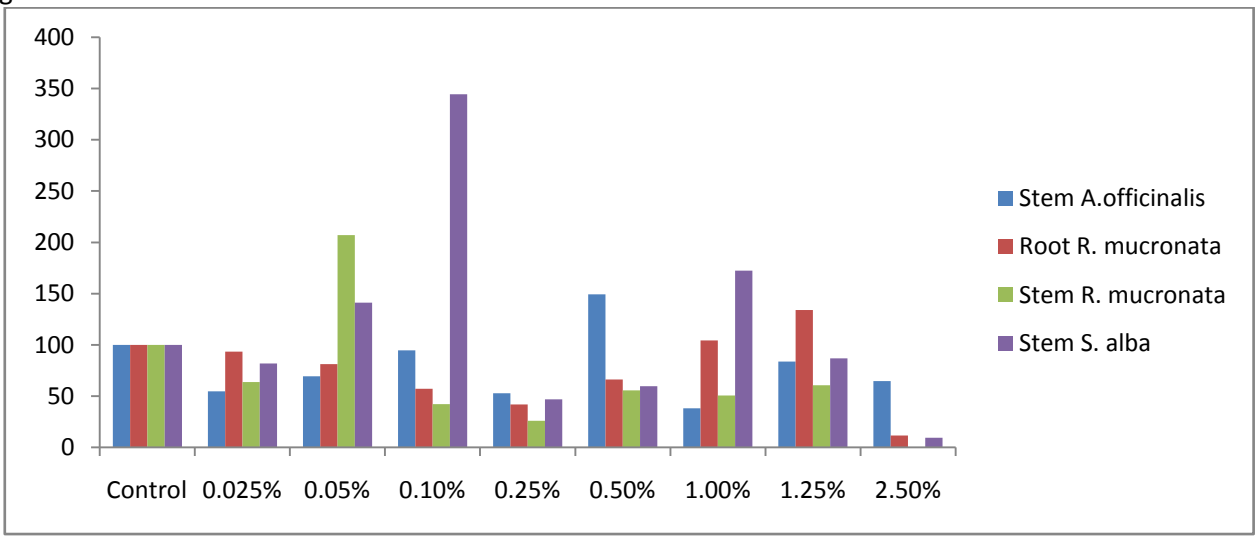

Fig.1 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings vigour index of *Amaranthus paniculatus.*

It is observed from the **Fig. 2** that the seedling vigour index of Ratnagiri variety -1 stimulated due to *A. officinalis* 2.5%stem extract, 0.025% root extract and 0.50% stem extract of *R. mucronata* and *S. alba* 0.25% stem extract also exhibits maximum seedling vigour.

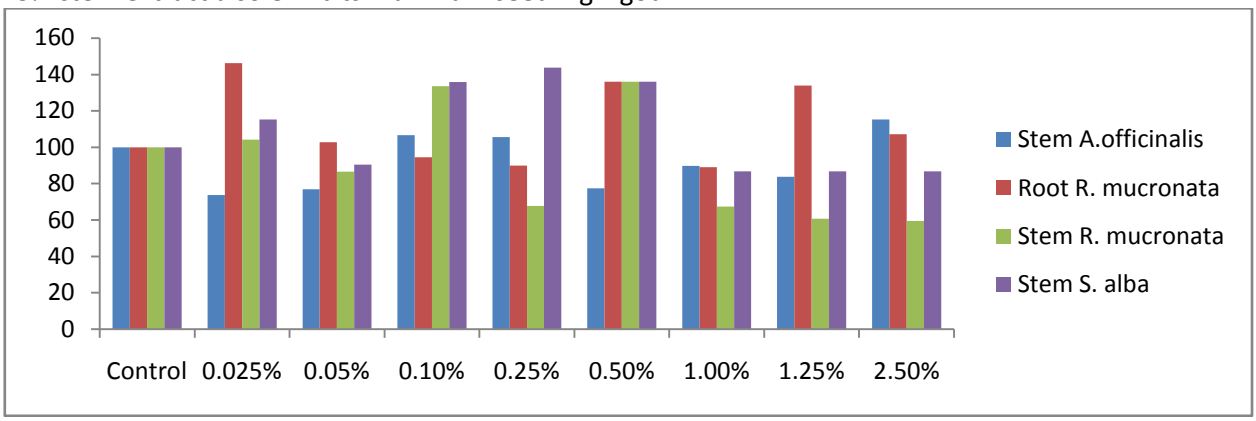

Fig.2 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings vigour index of Ratnagiri -1.

From the **Fig. 3** it is notice that Ratnatgiri variety- 24 shows increased inresponse to *A. officinalis* 0.025% stem extract, *R. mucronata* 0.25% root and 0.10% stem extract and *S. alba* 0.25% stem extracts.

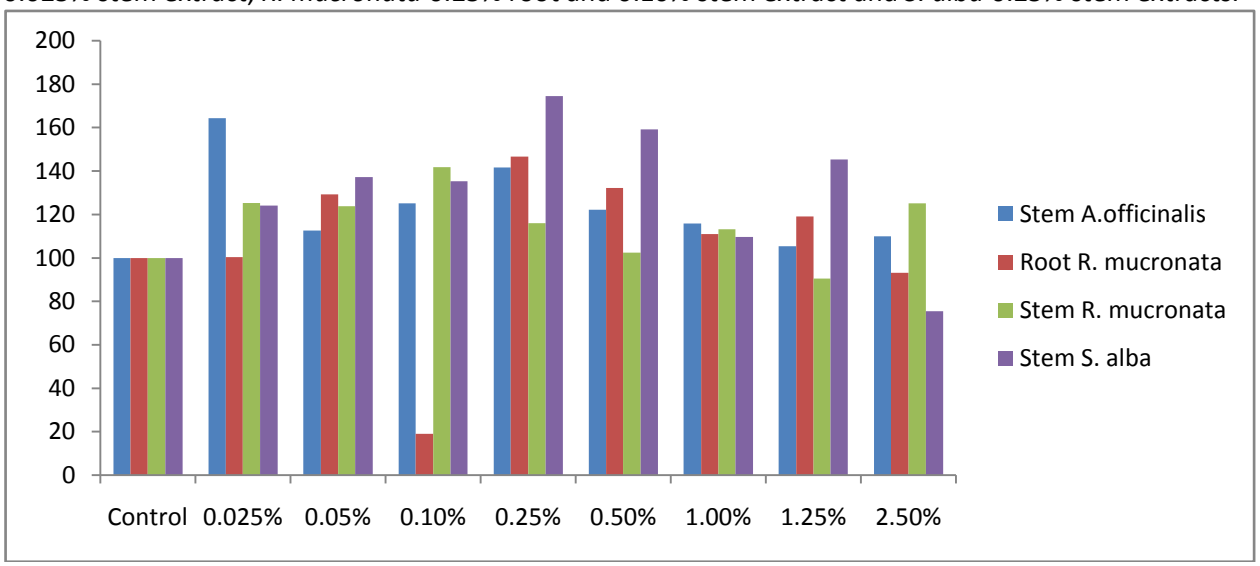

Fig.3 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings vigour index of Ratnagiri -24.

It is evident from **Fig. 4** the seedling vigour of rice variety Ratnagiri-711 is stimulated in respond to *A. officinalis* 0.25% stem extract, *R. mucronata* 0.5% root and 0.1% stem bark extract and *S. alba* 1% stem bark extract . Increase in seed germination by aqueous extracts of plants viz., *Achyranthes aspera, Adhatoda vesica, Allium sativum, A. cepa, Azadirachta indica, Cuscuta reflexa, Lawsonia alba, Nigella sativa, Vicia rosea* and *Zingiber officinale* (Hasan *et al*., 2005). Parvez *et al.* (2004) have observed that the aqueous extract of *Tamarindus indica* bark inhibited seed germination in various crop plants, Asperagus, Cucumber, Lettuce, Radish and Tomato. Krishna *et al*. (2007) have screened the effect of variety of weeds on seed germination of rice. The *Cassia tora* weed extract showed stimulatory effect on seed germination of rice variety Abhilash-9926.

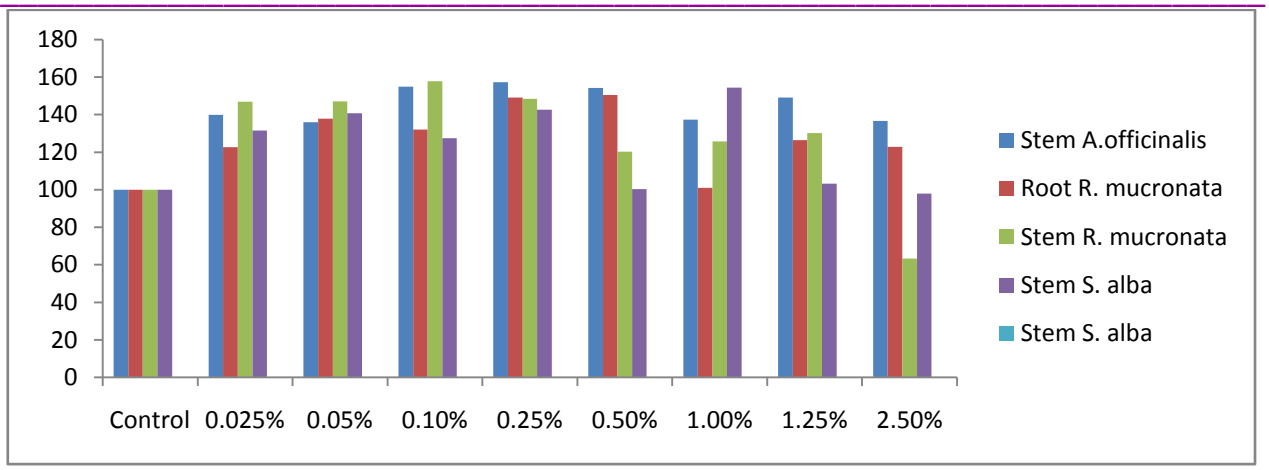

Fig.4. Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings vigour index of Ratnagiri -711.

Fig. 5 shows moisture content of seedlings is stimulated due to application of 0.1% stem extract of *S. alba* while **Fig. 6** shows total length of seedling length of *Amaranthus* is stimulated due to 0.1% stem extract of *S. alba.*

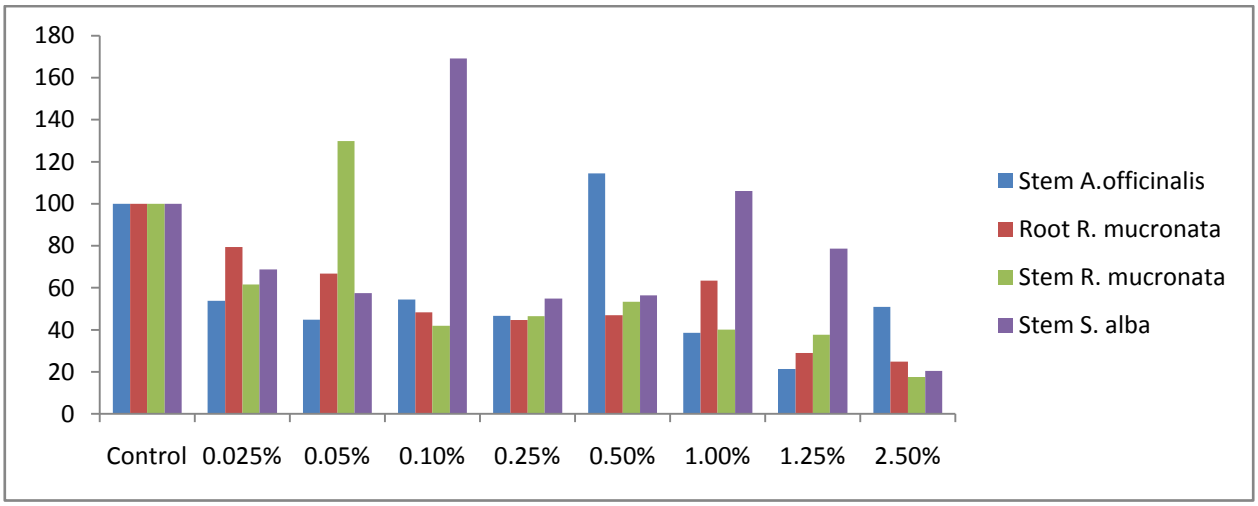

Fig. 5 Effect of aqueous extract of *Amaranthus paniculatus* bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings moisture content of *Amaranthus paniculatus* .

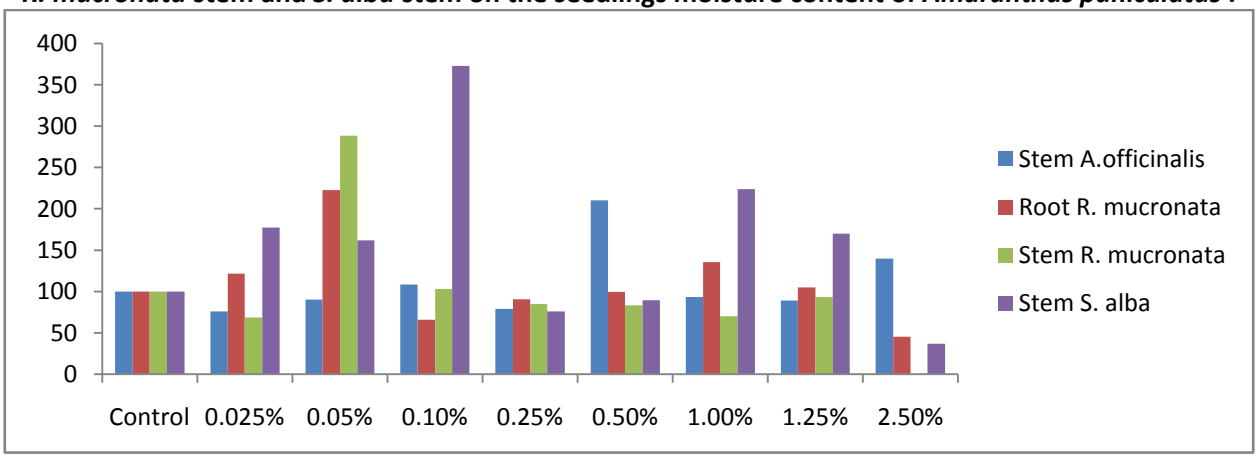

Fig. 6 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the total length of *Amaranthus paniculatus* .

Effect of aqueous bark extracts (**Fig. 7**) of *R. mucronata* at the 1.25% moisture increased in ratnagiri variety 1 at the 1.25% concentration, while from the **Fig.8** it is clear that the 0.025% root extract of *R. mucronata* shows maximum seedling length of Ratnagiri var. 1. Sasikumar *et al.* (2001) investigated that the effect of bark extracts of *Eucalyptus* species, *E. camaldulensis, E. microthea, E. polycarpa* and *E. tereticornis* shows inhibitory effect on redgram and in wheat, rice and *Sorghum* at 20% (Djanaguiraman *et al.,* 2005). In seedlings of *Cucumis sativus, Raphanus sativum* and *Vigna unguiculata* the effect of aqueous extract of *Albezia lebbeck* was studied by Uddin *et al.* (2007). They observed that at lower concentration (10% and 20%) the shoot length stimulated and at higher concentration (50, 75 and 100%) inhibited.

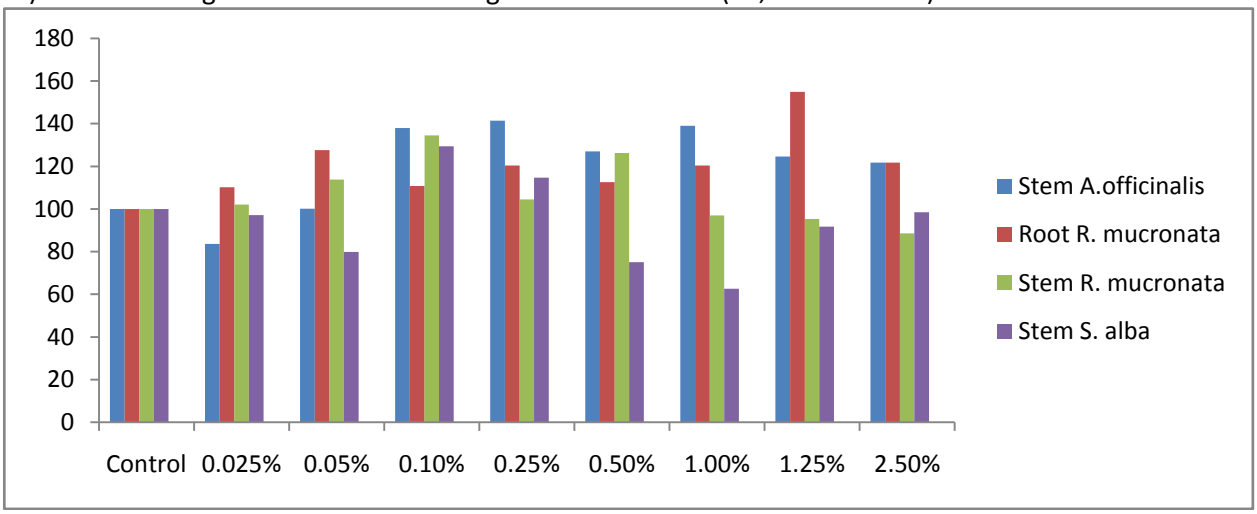

Fig.7 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings moisture content of Ratnagiri-1.

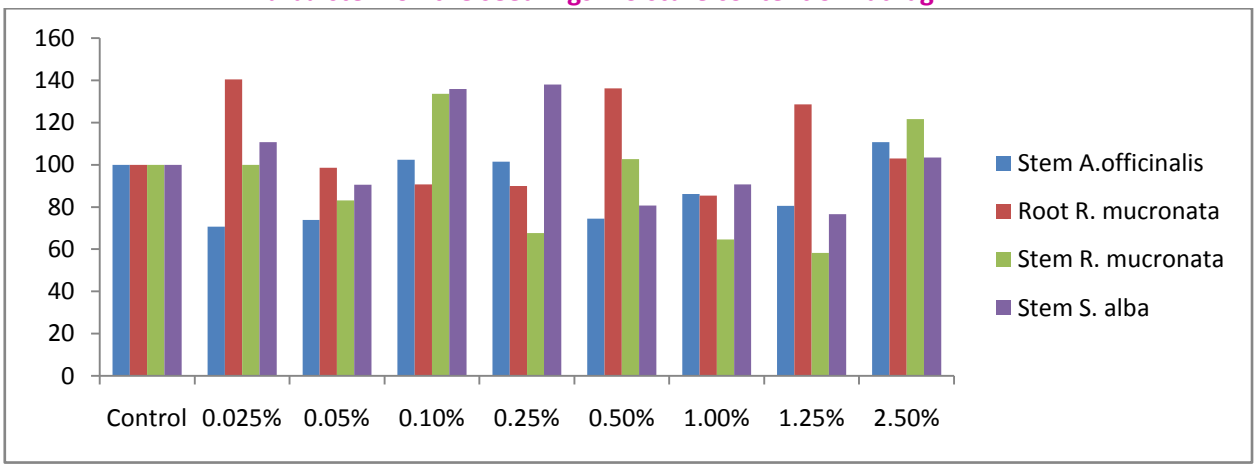

Fig. 8. Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the total length of Ratnagiri-1 .

Effect of aqueous bark extracts (**Fig. 9**) shows increased in moisture content of Ratnagiri var. 24 due to 0.025%stem extract of *A. officinalis*, 0.1% root extract of *R. mucronata*, 1.25% stem extract of *R. mucronata* and 1% stem extract of *S. alba.* It is found from the **Fig. 10** that the seedling length of Ratnagiri-24 is elevated due to 0.1% root extract of *R. mucronata.*

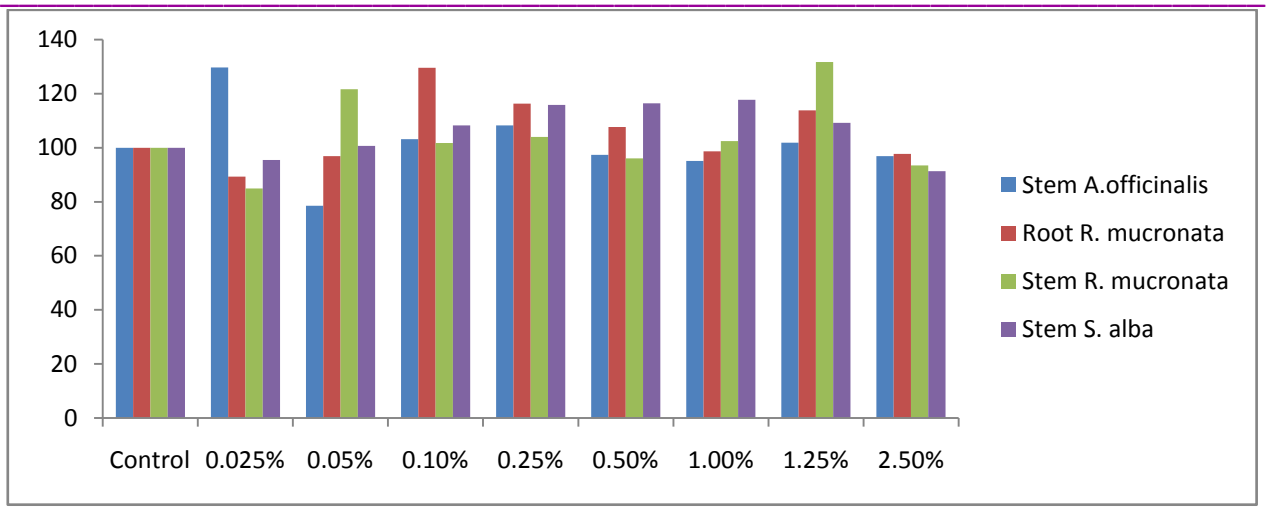

Fig.9 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings moisture content Ratnagiri- 24.

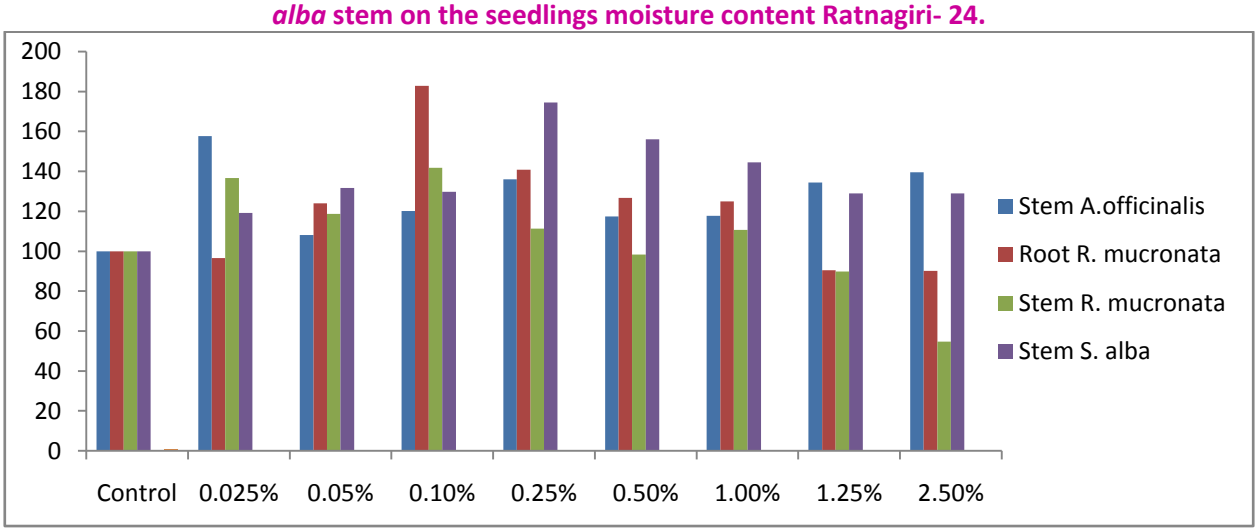

Fig. 10. Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the total length of Ratnagiri-24 .

Effect of aqueous bark extract (**Fig.11**) *A. officinalis* at 0.025% concentration, the root extract of *R. mucronata* at 0.1% and stem extract of *R. mucronata* at 1.25% concentration show elevation moisture content of rice var. Ratnagiri-711. Fffect of aqueous stem bark extracts (**Fig.12**) of *R. mucronata* at 1.25% concentraction shows higher seedling length of rice var. Ratnagiri-711. The effect of plant extract on plant growth of seedlings depends on concentration of compounds (Einhelling *et al*., 1985). Jaykumar *et al.* (1998) noticed that aqueous bark extract at lower concentrations of 5% and 10% stimulate the shoot length and root length of *Vigna radiata* but inhibited at higher concentration. Patil (2010) studied biotonic effect of bark of *T. arjuna* and *A. latifolia* contains higher amount of total phenolic content than *C. religiosa* and *P. marsupium* from family Combretaceae qualified to their high phenolics content and contains one or more growth inhibiting allelochemicals representatives of negative allelopathy (Huxley, 1999), whereas less inhibition observed by *C. religiosa* and *P. marsupium* due to their low phenolic content and absence of toxic phenolic in the bark extract exhibiting positive allelopathy (Fernandez *et al*., 2006). Our results are also similar as the earlier studies.

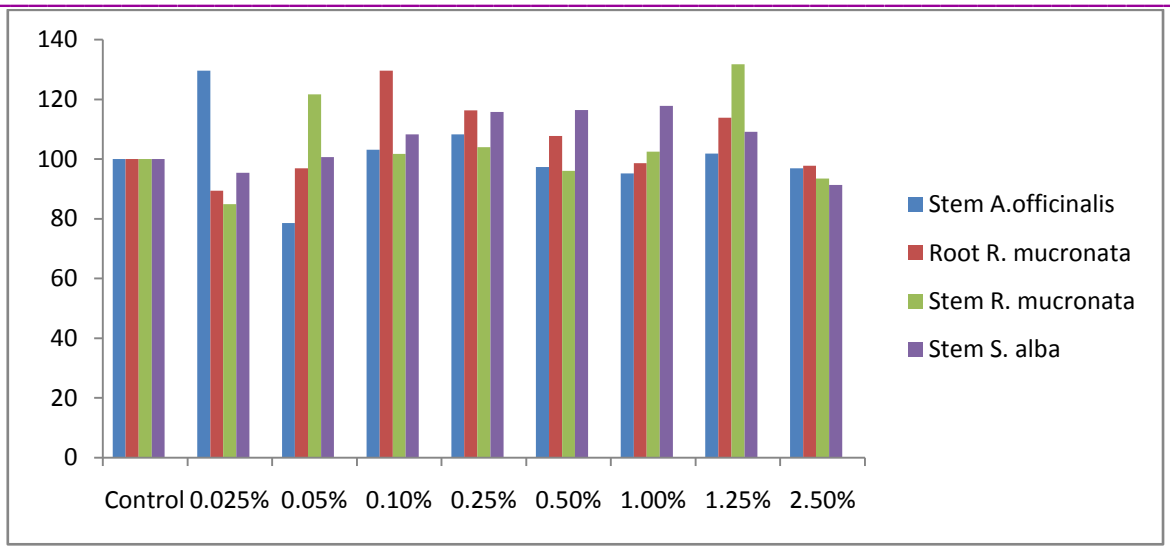

Fig.11 Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the seedlings moisture content Ratnagiri-711.

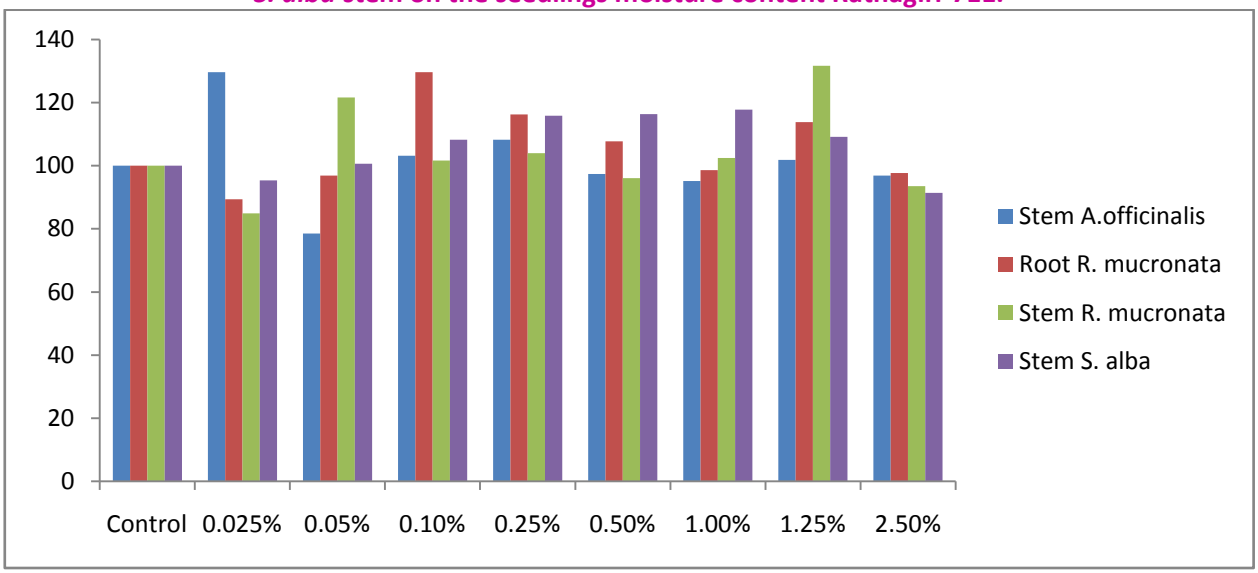

Fig. 12. Effect of aqueous extract of bark of *A. officinalis* stem, *R. mucronata* root , *R. mucronata* stem and *S. alba* stem on the total length of Ratnagiri-711.

CONCLUSION -

It can be concluded that the aqueous bark extract of *A. officinalis* stem, *R. mucronata* proproot, *R. mucronata* stem and *S. alba* stem exhibits an allelopathy and biotonic potential due to presence of bioactive compounds present in these mangrove bark which can be utilised as a marine bioresourse for development of various growth boosters in future to strengthen organic farming.

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