Journal of Algal Biomass Utilization
J. Algal Biomass Utln. - Copyright © PHYCOSPECTRUM
ISSN: 2229 – 6905

Effect of salinity on discharge of spores from seaweeds- a perspective

Narasimha Rao, G. M and N.V.JayanthBabu

Department of Botany, Andhra University, Visakhapatnam -530 003, INDIA

Abstract:
Seaweeds are commonly known as kelps comprise marine macro algae traditionally used as food, fodder, organic and bio- fertilizer in different geographical regions of the world. In the recent years these kelps are either harvested or cultivated for extraction of various chemical compounds which were used in food and non-food sector industries. These algal forms are also sources for biogas and biofuels. In India several seaweed based production units were either partially closed or permanently closed due to the shortage of sufficient raw material. Commercial cultivation of seaweeds would produce the required raw material for continuous running of the industries. Spores play an important role in the generating the seaweeds in a large quantity. Studies in connection with the spore shedding will be aid for the production of the required algal biomass in natural habitats. In the present paper data was summarized on the impact of salinity levels on spore shedding of some marine brown algae and red algae of Andhra Pradesh along the east coast of India.

Key words: Salinity, Marine red algae, Brown algae, spore shedding.

Introduction

Various types of spores are released by the marine algal forms for maintaining their progeny in the natural habitats for ever. Spores may be haploid or diploid similarly generate either haploid or diploid populations respectively. Several studies were undertaken in various parts of our country to find out the suitable season, suitable time for liberation of these important propogules. Besides environmental parameters such as temperature, light intensity, salinity, desiccation and thermal stress play an important role on the shedding of the spores. The present paper summarizes the discharge of spores from some important marine and estuarine algal species in different concentration of salinity levels.

Spore shedding in Marine red algae

Information on the effect of salinity on spore shedding of marine red algae in Indian waters was collected by different authors (Subba Rangaiah *et.al*.,1975; Umamaheswara Rao and Kaliaperumal,1983; Umamaheswara Rao and Subba Rangaiah, 1986; Subba Rangaiah,1986; Kaliaperumal and Umamaheswara Rao,1987; Narasimha Rao,1989a; Narasimha Rao and Subba Rangaiah,1991; Sudhakar and Subba Rangaiah,1997; Subba Rangaiah and Vanilla Kumari, 1997; Subba Rangaiah et al. 2012). In experiments conducted by Subba Rangaiah *et.al* (1975) with tetraspore shedding of *Gracilaria corticata* at Visakhapatnam, observed that the maximum shedding of tetraspores was found between 20 and 30 ppt salinity. Umamaheswara Rao and Kaliaperumal (1983) collected the information on the effects of salinity on the liberation of spores from *Gelidium pusillum, Pterocladia heteroplatos* and *Gelidiopsis variabilis.* Sea water of 30 to 40 ppt salinity was found to be favorable for maximum shedding of spores at the coastal waters of Visakhapatnam. Umamaheswara Rao and Subba Rangaiah (1986) studied the tetraspore shedding from *Gracilaria textorii, Gracilariopsis sjoestedtii* and *Hypnea valentiae* from Visakhapatnam coast. Maximum shedding of tetraspores was found in between 20 and 30‰ salinity. Data collected by Subba Rangaiah (1986) on monospore shedding from *Porphyra vietnamensis*. Spore liberation was noticed from 10 to 60 ‰ salinity with maximum output in salinities between 20 and 30 ‰ salinity. Narasimha Rao and Subba Rangaiah (1991) studied the effect of various salinities on monospore shedding from *Bangiopsis subsimplex*, monospore and carpospores shedding from *Porphyra vietanamensis* growing on the Visakhapatnam coast. In laboratory experiments, conducted by them on these two red algal members reveals that 30 to 40 ppt salinity was found to be favorable conditions for the maximum liberation of spores.

In *Amphiroa fragilissima, Jania rubens and Grateloupia lithophila* (Subba Rangaiah and Vanilla kumari, 1997) observed that the maximum spore out observed at 20 to 40 ‰ salinity. Sudhakar and Subba Rangaiah (1997) obtained the similar results on *Polysiphonia platycarpa* at Visakhapatnam coast. In *Wrangelia argus, Centroceras clavulatum* and *Polysiphonia platycarpa* (Sudhakar and Subba Rangaiah, 1997), In *Agloathamnion cordatum*, the maximum shedding of tetraspores was observed at 30 to 40 ppt salinity (Sudhakar and Subba Rangaiah, 1997). Subba Rangaiah, et al (2012) studied the effect of salinity on the spore shedding from *Gracilaria corticata* and reported that the maximum numbers of tetraspores were liberated from the fronds at 30 ppt salinity. Narasimha Rao and Umamaheswara Rao (1991) studied the effect of salinity on the spore liberation from the two estuarine red algae *Bostrychia tenella* and *Caloglossa leprieurii occurring at Godavari estuary* near Kakinada. The maximum number of tetraspore and carpospores were liberated when the salinity was 20 ppt salinity.

Spore shedding in Marine brown algae

Information on the effects of salinity on the liberation of various spores from the marine brown algae of Indian waters was collected by several authors (Umamaheswara Rao and Sanjeeva Reddy, 1982; Narasimha Rao,1989a; 1989b; Narasimha Rao and Subba Rangaiah,1991; Narasimha Rao, 2014). Umamaheswara Rao and Sanjeeva Reddy (1982) studied the on tetraspore shedding in *Dictyota dichotoma* at Visakhapatnam coast and observed that the spore output was maximum in the salinities between 25 and 35‰. Narasimha Rao (1989b) collected the information on spore shedding from *Rosenvingea nhatrangensis* growing at Visakhapatnam coast and observed that the maximum plurispore discharge was observed at 30‰ salinity. Spore out put was decreased from 30‰ salinity onwards and minimum at 50‰ salinity. Narasimha Rao and Subba Rangaiah (1991) studied the effect salinity on the spore shedding in *Ectocarpus mitchellae* growing at Visakhapatnam coast. In their study, they reported that the maximum number of plurispores was liberated at 30‰ salinity. No plurispore shedding was observed at 10 and 60‰ salinities. Appa Rao (1995) studied the effect of environmental factors on tetraspore shedding in *Padina tetrastromatica* growing at Visakhapatnam coast. Maximum number of tetraspores were released at 30‰ salinity. Appa Rao (1998) observed that maximum number of oospores were liberated in between 20 and 30 ‰ salinities which was favorable for maximum liberation of oospores. Subba Rangaiah et al (2012) studied the effect of salinity on oospore output from the *Sargassum ilicifolium* and oospore discharge was observed from 10 to 60 ‰ salinities. Peak output of oospores was reported at 30 ‰ salinity. But considerable number of oospores was also seen liberating from the receptacles at 20 and 40 ‰ salinities.

Conclusions

Studies conducted by several authors revalidated that the environmental features especially salinity play important role in formation and liberation of various types spores to maintain their progeny on the earth. Species of the marine brown algae are seasonal forms which occur from the month of October to April or May on the rocky surfaces of the intertidal regions, while most of the red algal members are the perennial forms and discharge the spores. Sea water salinity varies depending on the seasonal changes such as monsoons, summer and winter. As a whole these algal forms are discharging the various types of spores in between 20 and 40 ppt salinities. These algal forms might have selected different timings as well as suitable saline conditions for their maximum liberation and better settlement of spores in natural habitats. Further they may also avoid the feeding by the different animals in the marine environment and nature itself might have set the timings for better settlement.

References

Appa Rao ,D. 1995. Studies of spore shedding in *Padina tetrastromatica* Hauck (Phaeophyceae) of the Visakhapatnam coast. M.Phil. dissertation, Andhra University, Waltair (India).

Appa Rao ,D. 1998. Studies on the ecology of some species of Sargassum (Fucales, Phaeophyceae) along the Visakhapatnam coast. (India). Ph.D thesis, Andhra University, Visakhapatnam.

Kaliaperumal, N. and Umamaheswara Rao, M. 1987. Effect of thermal stress on spore shedding in some red algae of Visakhapatnam coast. Indian J. Mar.Sci., 16: 201-202.

Narasimha Rao,G.M.1989a. Ecological studies on some estuarine and marine algae. Ph.D. thesis, Andhra University, Waltair.

Narasimha Rao,G.M.1989b. Effect of environmental factors on spore shedding from *Rosenvingea nhatrangensis* Dawson. Mahasagar . Vol. 22. (3) 135-137.

Narasimha Rao,G.M. and Umamaheswara Rao, M. 1991.Spore discharge in the red algae *Bostrychia tenella* and *Caloglossa leprieurii* from the Godavari estuary, India. J.Appl. Phycol., Vol.3: 153-158.

Narasimha Rao,G.M. and Subba Rangaiah,G. 1991. Control of spore shedding from some marine algae of the Visakhapatnam coast, India. Br. Phycol. J. Vol.26: 356-

Narasimha Rao ,G.M.. 2014. Seasonal growth and spore shedding in Lobophora variegata (Lamouroux) Womersley ex Oliveira from Bhimili, Andhra Pradesh, India. J.Algal Biomass Utln. Vol. 5 (4) 9-11.

Subba Rangaiah.G. 1983. Effect of environmental factors on germination and growth in *Hypnea valentiae* (Turn.) Mont. All India Phycological Congress, Kanpur: 235-243

Subba Rangaiah.G. 1986. Effects of environmental factors on the shedding of monospores from *Porphyra vietnamensis* Tanaka et. Ho of the Visakhapatnam coast. Phykos., Vol: 29-35.

Subba Rangaiah.G., Umamaheswara Rao, M. and Rao, B.G.S. 1975. Effect salinity on spore shedding in *Gracilaria corticata*. Curr. Sci., 44: 717-718.

Sudhakar, S. and Subba Rangaiah, G. 1997. Diurnal periodicity in the shedding spores in *Polysiphonia platycarpa* Borgesen (Rhodophceae, ceramiales) of the Visakhapatnam coast. National symposium on recent trends in algal research, March 6-8. Andhra University, Waltair.

Subba Rangaiah, G. and Vanilla Kumari,E. 1997. Effects of environmental factors on spore shedding in *Jania rubens* (L.) Lamouroux (Rhodophyceae-, Cryptonemiales) of the Visakhapatnam coast. National symposium on recent trends in Algal Research, Andhra University, Waltair. March 6-8.

Subba Rangaiah,G. G.M.Narasimha Rao and K.Deepthi Lavanya. 2012. Effect of environmental factors on oospore sheeding in Sargassum ilicifolium C. Agardh. J. Algal biomass Utln. 3 (2) 57-64

Subba Rangaiah, G., G.M.Narasimha Rao and K. Deepthi Lavanya. 2012a. Effect of environmental factors on spore shedding in Gracilaria corticata J.Agardh. Plant Science Research 34 (1&2): 43-46.

Umamaheswara Rao, M. and Sanjeeva Reddy, R.B. 1982. Influence of desiccation, salinity and temperature on the liberation and germination of *Dictyota dichotoma*. Seaweed Res. Utiln. Vol. 6:5-9.

Umamaheswara Rao,M. and Subba Rangaiah, G. 1986. Effect of environmental factors on the diurnal periodicity of tetraspores of some Gigartinales (Rhodophyta). Proc.Symp. Coastal Aquaculture. $: 1199-1205.