



DENSITY AND BIODIVERSITY OF BGA IN RICE FIELDS OF GOA

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INTRODUCTION

Ø Goa is a coastal region with a hot, humid and tropical climate with about 54 thousand hectares of land under rice cultivation, which is the staple food of Goans (Sakshena, 2003).

Ø Rice (*Oryza sativa* L), the staple food of Goans is being cultivated over an area of 54,000 hectares both in Kharif (44,000 ha) and Rabi (10,000 ha).

Ø This cereal crop accounts for 31% of the total cropped area and 86% of the food grain production. It is cultivated on different land types viz Khazan lands (coastal saline lands).

Ø Our investigation was directed towards evaluating the density and diversity of BGA in four different types of rice fields in Goa which are influenced by different environmental conditions.

MATERIALS AND METHODS

- Ø Four sites selected viz. Hinterlands, Coastal area, Khazan lands, Mining area.
- Ø The physicochemical characteristics of the sampling sites were analyzed for EC and pH.
- Ø Collection and identification of BGA from paddy fields in all the sites during Khariff and Rabi season.

Ø For quantitative analysis the sample was analyzed by lackey's drop method (1938) as mentioned in APHA (1985), The formula used was:-

$$\text{Phytoplankton unit per liter} = \frac{n \times c}{V} \times 1000$$

Where n= number of phytoplanktons counted in 0.1ml. (1 drop of concentrate)

c= total volume of concentrate in ml.

V=total volume of water filtered in liters.

- Ø The data collected for three years of study period was statistically analyzed using PAST statistical package. Shannon (H), Simpson (1-D) and Margalef diversity indices were analyzed.

RESULTS

Ø The slightly alkaline pH of 7 was recorded in the hinterland paddy fields of Quepem with an EC of 3.5 d sm^{-1} whereas coastal region of Utorda recorded a pH of 6.8 with a moderate EC of 3.0 d sm^{-1} . The other two sampling sites recorded acidic pH in the range of 5 to 6 with a high EC of 7.6 d sm^{-1} in Quelossim khazans and a low EC of 0.5 d sm^{-1} in Velguem mining area fields.

Ø Density data shows the highest a density of 640 cells/ml in khariff season of heterocystous forms in the hinterlands of Quepem in the year 2006-2007 followed by coastal region of Utorda which recorded 540 cells/ml and the least were recorded in mining fields 320 cells/ml followed by khazan lands with 500 cells/ml.

Ø Rabi season recorded comparatively less than khariff in hinterlands (610 cells/ml) and khazan lands (470 cells/ml) and comparatively more in the remaining two habitats. Overall the data indicates the predominance of heterocystous forms in all the 4 habitats followed by non-heterocystous and unicellular forms (Table 2)

Table 1: Details of physicochemical characteristics of soil and water of the sampling area during study period of 2006-2009.

| Location | Soil | | Water | |
|--------------------|---------------------------|-----------|--------------------------|-----------|
| parameters | EC dsm ⁻¹ ± SD | pH ± SD | EC dsm ⁻¹ ±SD | pH ± SD |
| Quepem hinterlands | 3.5 ± 0.1 | 7.3 ± 0.2 | 3.2 ± 0.1 | 7.0 ± 0.1 |
| Utorda coastal | 3.0 ± 0.2 | 6.8 ± 0.1 | 2.8 ± 0.2 | 6.9 ± 0.2 |
| Quelossim khazans | 7.68 ± 0.1 | 5.0 ± 0.1 | 7.5 ± 0.1 | 5.3 ± 0.1 |
| Velguem mines | 0.5 ± 0.2 | 5.2 ± 0.2 | 0.48 ± 0.2 | 4.9 ± 0.1 |

Table 2: Density of BGA at different habitats during the study period 2006-2009.

| Group/place | | 2006-2007 seasons | | 2007-2008 seasons | | 2008-2009 seasons | |
|---------------------------|-----------|----------------------|------|----------------------|------|----------------------|------|
| | | khariff | rabi | khariff | rabi | khariff | rabi |
| Quepem Hinterlands | | | | | | | |
| Heterocystous | number/ml | 640 | 610 | 620 | 600 | 510 | 560 |
| Non-Heterocystous | number/ml | 470 | 400 | 430 | 440 | 440 | 480 |
| Unicellular | number/ml | 480 | 500 | 510 | 480 | 440 | 440 |
| Utorda-coastal | | | | | | | |
| Heterocystous | number/ml | 540 | 560 | 530 | 550 | 600 | 550 |
| Non-Heterocystous | number/ml | 540 | 540 | 530 | 500 | 530 | 540 |
| Unicellular | number/ml | 440 | 470 | 460 | 500 | 530 | 540 |
| Quelossim-Khazans | | | | | | | |
| Heterocystous | number/ml | 500 | 470 | 450 | 460 | 420 | 390 |
| Non-Heterocystous | number/ml | 430 | 450 | 440 | 440 | 460 | 470 |
| Unicellular | number/ml | 350 | 380 | 360 | 390 | 340 | 400 |
| Velguem mines | | | | | | | |
| Heterocystous | number/ml | 320 | 340 | 340 | 320 | 350 | 310 |
| Non-Heterocystous | number/ml | 310 | 290 | 290 | 310 | 340 | 330 |
| Unicellular | number/ml | 260 | 270 | 220 | 290 | 250 | 220 |

Table 3: Comparative diversities of BGA of different habitats.

| Year of study | 2006-2007 | | | | | | 2007-2008 | | | | | | 2008-2009 | | | | | |
|-------------------|-----------|---------|----------|---------|---------|----------|-----------|---------|----------|---------|---------|----------|-----------|---------|----------|---------|---------|----------|
| Season | Khariff | | | Rabi | | | Khariff | | | Rabi | | | Khariff | | | Rabi | | |
| Diversity indices | Shannon | Simpson | Margalef | Shannon | Simpson | Margalef | Shannon | Simpson | Margalef | Shannon | Simpson | Margalef | Shannon | Simpson | Margalef | Shannon | Simpson | Margalef |
| Heterocystous | | | | | | | | | | | | | | | | | | |
| Hinterlands | 1.597 | 0.7949 | 0.9618 | 1.608 | 0.7992 | 0.973 | 1.606 | 0.799 | 0.9692 | 1.602 | 0.7972 | 0.977 | 1.601 | 0.797 | 1.017 | 1.604 | 0.798 | 0.9937 |
| coastal | 1.605 | 0.7984 | 1.003 | 1.601 | 0.7966 | 0.9937 | 1.607 | 0.799 | 1.007 | 1.596 | 0.7947 | 0.9982 | 1.608 | 0.799 | 0.977 | 1.593 | 0.793 | 0.9982 |
| khazans | 1.604 | 0.7976 | 1.022 | 1.608 | 0.7995 | 1.039 | 1.607 | 0.799 | 1.051 | 1.606 | 0.7987 | 1.045 | 1.608 | 0.799 | 1.07 | 1.605 | 0.798 | 1.092 |
| mining | 1.607 | 0.7988 | 1.154 | 1.603 | 0.7976 | 1.134 | 1.603 | 0.798 | 1.134 | 1.607 | 0.7988 | 1.154 | 1.601 | 0.797 | 1.125 | 1.602 | 0.797 | 1.165 |
| Non-heterocystous | | | | | | | | | | | | | | | | | | |
| Hinterlands | 1.606 | 0.7986 | 1.039 | 1.6 | 0.7962 | 1.084 | 1.605 | 0.798 | 1.063 | 1.603 | 0.7975 | 1.057 | 1.606 | 0.799 | 1.057 | 1.608 | 0.8 | 1.033 |
| coastal | 1.605 | 0.7984 | 1.003 | 1.598 | 0.7956 | 1.003 | 1.605 | 0.798 | 1.007 | 1.607 | 0.7992 | 1.022 | 1.603 | 0.797 | 1.007 | 1.6 | 0.796 | 1.003 |
| khazans | 1.593 | 0.7939 | 1.063 | 1.602 | 0.797 | 1.051 | 1.606 | 0.799 | 1.057 | 1.6 | 0.7965 | 1.057 | 1.606 | 0.799 | 1.045 | 1.604 | 0.798 | 1.039 |
| mining | 1.602 | 0.7971 | 1.165 | 1.601 | 0.7967 | 1.188 | 1.601 | 0.797 | 1.188 | 1.597 | 0.795 | 1.165 | 1.608 | 0.799 | 1.134 | 1.607 | 0.799 | 1.144 |
| Unicellular | | | | | | | | | | | | | | | | | | |
| Hinterlands | 1.606 | 0.7986 | 1.033 | 1.604 | 0.7976 | 1.022 | 1.603 | 0.797 | 1.017 | 1.608 | 0.7995 | 1.033 | 1.606 | 0.799 | 1.057 | 1.606 | 0.799 | 1.057 |
| coastal | 1.606 | 0.7986 | 1.057 | 1.606 | 0.7986 | 1.039 | 1.606 | 0.799 | 1.045 | 1.607 | 0.7992 | 1.022 | 1.603 | 0.797 | 1.007 | 1.6 | 0.796 | 1.003 |
| khazans | 1.601 | 0.7967 | 1.125 | 1.607 | 0.7992 | 1.1 | 1.604 | 0.798 | 1.116 | 1.605 | 0.7982 | 1.092 | 1.603 | 0.798 | 1.134 | 1.606 | 0.799 | 1.084 |
| mining | 1.599 | 0.7959 | 1.228 | 1.592 | 0.7929 | 1.214 | 1.603 | 0.798 | 1.294 | 1.601 | 0.7967 | 1.188 | 1.587 | 0.79 | 1.243 | 1.603 | 0.798 | 1.294 |

CONCLUSION

The present study indicates a moderately rich but variable diversity of BGA in Goan rice fields. It is evident from the results that though the count of heterocystous BGA was the highest in all rice fields but the diversities of all groups are moderately high in all the four habitats. Thus the present investigation throws light on the density and diversities of BGA in Goan rice fields especially with regard to the indigenous species which could help in development of niche specific inocula for Goan rice fields.





Thank you

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