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THE INFLUENCE OF SALINITY AND UREA FERTILIZER DOSAGE ON THE POPULATION GROWTH OF *Spirulina* sp.

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ABSTRACT

Research on Spirulina sp. has been developed since it was found to have a high economic value and as healthful as human traditional food such as the fishes. Therefore, the factors that influence the culturing of this algae should be maintained properly to obtain a high quantity and quality of the product.

This research was done to determine the interaction of salinity and the dosage of urea fertilizer on the population growth of Spirulina sp. Factorial design with the combination treatment of four salinities (12,5 ppt, 15 ppt, 17,5 ppt, 20 ppt) and three dosages of urea fertilizer (80 ppm, 100 ppm, 120 ppm), are applied with 3 replications.

The result indicated that the highest Spirulina sp. population is 321000 unit/ml, wet weight is 3,349 gr/l and dry weight is 1,315 gr/l which was found on the 20 ppt salinity and 120 ppm of urea fertilizer dosage.

Key word : *Spirulina* sp., salinity, urea fertilizer, population growth.

I. INTRODUCTION

Microalgae has many advantages as a natural food in hatcheries. One of the microalgae which was used as natural food in hatcheries especially for larvae of fishes and Crustacea such as Artemia and Copepoda (Guillard, 1973) is *Spirulina* sp. This algae contains a high plant protein (63-68 %) of the dry weight, fat, carbohydrate, vitamin, etc.

As fish food *Spirulina* sp. can be given in a fresh or dry form (Soong, 1980). *Spirulina* sp have been used by the Mexicans and Africans as human food (Venkarataman, 1983). In Japan, *Spirulina* sp. is used as health food (Teloor *et al*, 1982).

In a large-scale culture, the factors that influence the media should be controlled. Although *Spirulina* sp. is a euryhaline species, in culturing this algae salinity should be maintained since it affects pH cytoplasmic which in turn causes a reduction of enzymatic activity and finally reduce population growth.

To enhance *Spirulina* sp. growth, nitrogen is also required. In a culture, urea fertilizer could be used as a source of

nitrogen. Nitrogen has been involved in synthetic protein.

Because of the importance of salinity and urea fertilizer, this research was conducted in order to investigate the interaction between salinity and urea fertilizer dosage for the population growth.

II. MATERIAL AND METHODS

The preliminary experiment was performed to find the range of optimum salinity concentration for the growth of *Spirulina* sp. population, which will be used as the base of this research. The concentration treated on *Spirulina* sp. culture were 0, 10, 20, 30 and 40 ppt, respectively, and this experiment was controlled continuously for 12 days.

This research is based on the preliminary experiment which resulted in the range of salinity between 10 and 20 ppt . Then the salinity was divided into four concentrations: 12,5; 15; 17,5 and 20 ppt. These salinities were combined with three dosages of urea fertilizer (80, 100 and 120 ppm), and was applied with three replications.

The growth of *Spirulina* sp. was counted everyday with a Sedgewick Rafter Counter. Wet weight of *Spirulina* sp. was measured on the 10 th day and dry weight of *Spirulina* sp was dried in the oven.

Analysis of variance was then calculated based on the F test value, followed by DMRT.

III. RESULT AND DISCUSSION

The salinity treatment in the preliminary experiment shows a normal population growth of *Spirulina* sp., but the optimal growth was found in the salinity concentration of 20 ppt. However, on the 9 th day, it was almost similar with 10 ppt (Figure 1). Therefore the best range of salinity population growth of *Spirulina* sp. in the preliminary experiment was between 10 ppt and 20 ppt.

On the basis of those range, the salinity concentration used in this reaserch was 12,5 ppt, 15 ppt, 17,5 ppt and 20 ppt. Each salinity was combined with urea fertilizer dosage 80 ppm, 100 ppm and 120 ppm. Figure 2 showed that the optimal population growth was at 20 ppt for salinity concentration and 80 ppm for urea fertilizer dosage. The other treatments showed that population growth was normal, but was not as high as the population growth at 20 ppt (salinity) and 80 ppm (urea fertilizer).

Understandably, salinity and urea fertilizer are important to the population growth of *Spirulina* sp. This is because salinity has a role in the glicolysis enzymatic process (Dawes, 1987), whereas urea has a role as a Nitrogen resource which might enhance the population growth (Sandgren, 1988).

In addition to the population growth, salinity and urea fertilizer will also increase the wet weight and dry weight of *Spirulina* sp. (Figure 3.)

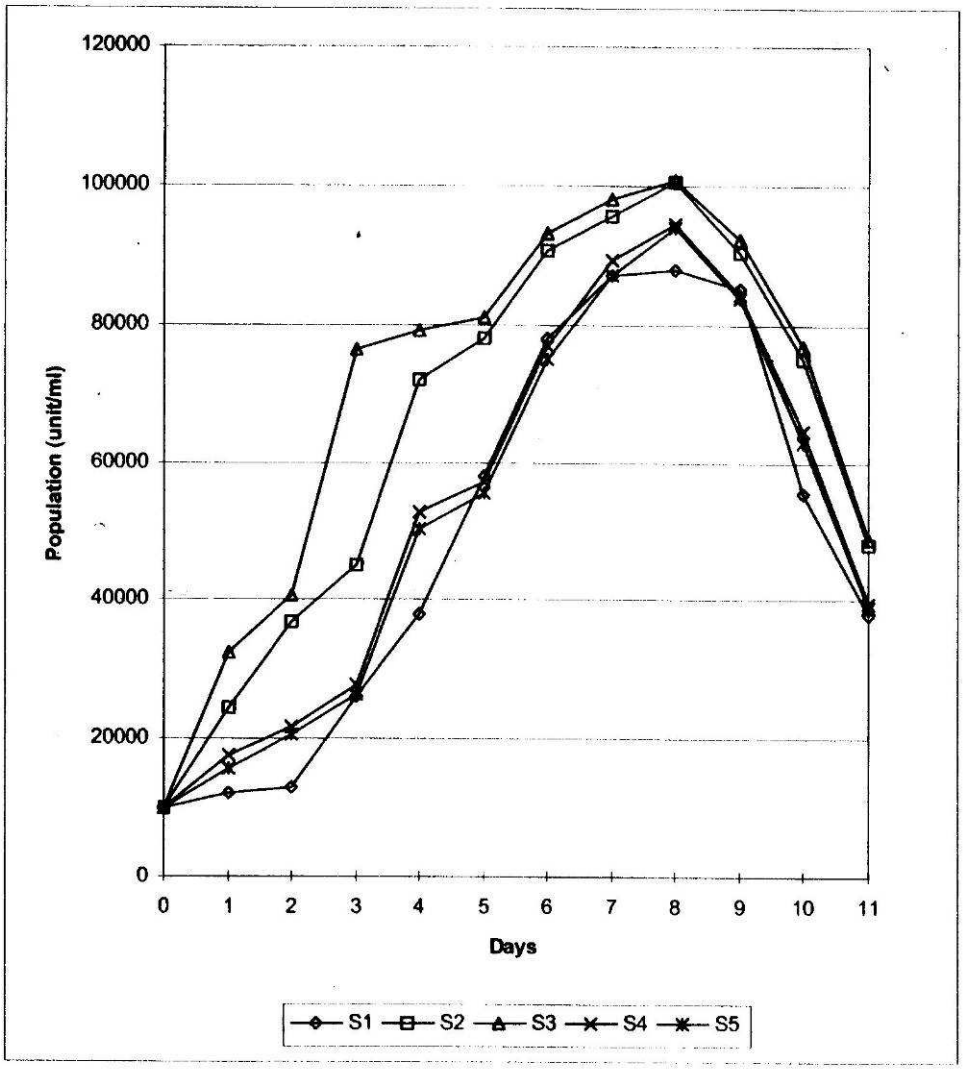

Figure 1: Population Growth of *Spirulina* sp. in The Preliminary Experiment

S1= 0 ppt of salinity
S2= 10 ppt of salinity
S3= 20 ppt of salinity
S4= 30 ppt of salinity
S5= 40 ppt of salinity

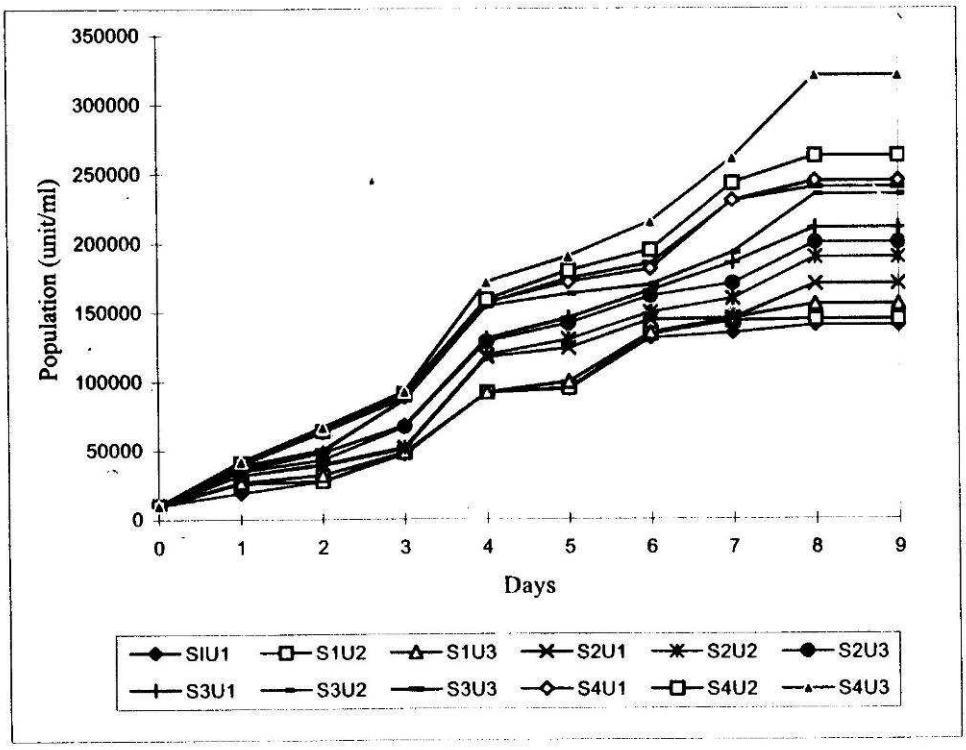

Figure 2. Population Growth of *Spirulina* sp. in The main Experiment

S1U1 = 12,5 ppt of salinity and 80 ppm of urea fertilizer dosage
S1U2 = 12,5 ppt of salinity and 100 ppm of urea fertilizer dosage
S1U3 = 12,5 ppt of salinity and 120 ppm of urea fertilizer dosage
S2U1 = 15 ppt of salinity and 80 ppm of urea fertilizer dosage
S2U2 = 15 ppt of salinity and 100 ppm of urea fertilizer dosage
S2U3 = 15 ppt of salinity and 120 ppm of urea fertilizer dosage
S3U1 = 17,5 ppt of salinity and 80 ppm of urea fertilizer dosage
S3U2 = 17,5 ppt of salinity and 100 ppm of urea fertilizer dosage
S3U3 = 17,5 ppt of salinity and 120 ppm of urea fertilizer dosage
S4U1 = 20 ppt of salinity and 80 ppm of urea fertilizer dosage
S4U2 = 20 ppt of salinity and 100 ppm of urea fertilizer dosage
S4U3 = 20 ppt of salinity and 120 ppm of urea fertilizer dosage

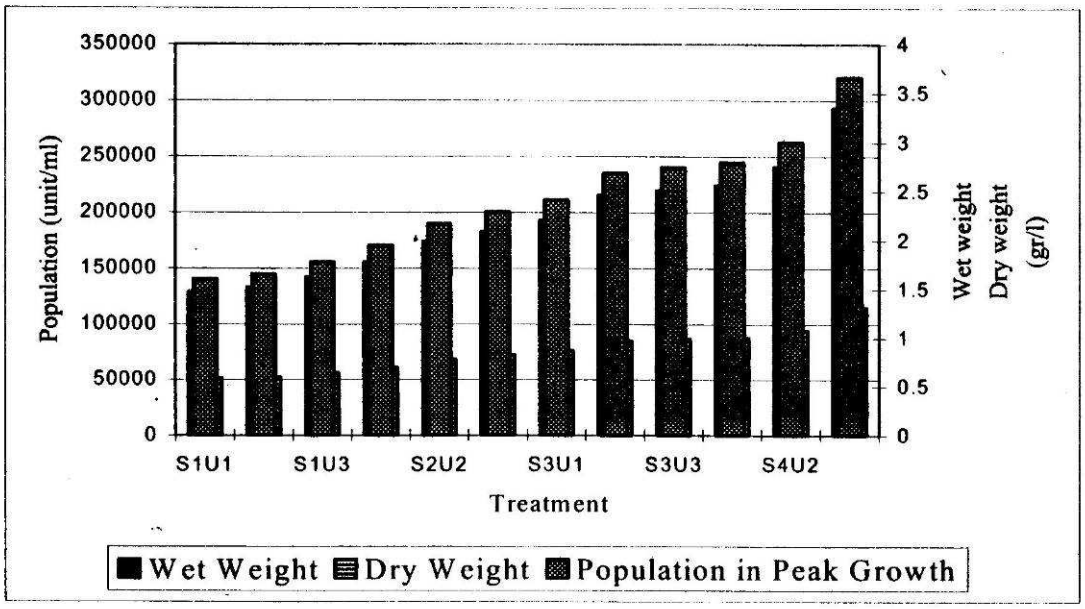

Figure 3.

Histogram of The Mean Population in Peak Growth, Wet Weight and Dry Weight of *Spirulina* sp.

S1U1: 12,5 ppt of salinity and 80 ppm of urea fertilizer dosage
S1U2: 12,5 ppt of salinity and 100 ppm of urea fertilizer dosage
S1U3: 12,5 ppt of salinity and 120 ppm of urea fertilizer dosage
S2U1: 15 ppt of salinity and 80 ppm of urea fertilizer dosage
S2U2: 15 ppt of salinity and 100 ppm of urea fertilizer dosage
S2U3: 15 ppt of salinity and 120 ppm of urea fertilizer dosage
S3U1: 17,5 ppt of salinity and 80 ppm of urea fertilizer dosage
S3U2: 17,5 ppt of salinity and 100 ppm of urea fertilizer dosage
S3U3: 17,5 ppt of salinity and 120 ppm of urea fertilizer dosage
S4U1: 20 ppt of salinity and 80 ppm of urea fertilizer dosage
S4U2: 20 ppt of salinity and 100 ppm of urea fertilizer dosage
S4U3: 20 ppt of salinity and 120 ppm of urea fertilizer dosage

IV. CONCLUSION

The highest growth of the *Spirulina* sp. population was found at 20 ppt of salinity concentration and 120 ppm of urea fertilizer dosage. There is a significant interaction of salinity and urea fertilizer dosage for increasing the population growth *Spirulina* sp.

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