EFFECTS OF SAGO FACTORY EFFLUENTS ON RICE CULTIVATION
WITH SPECIAL REFERENCE TO BIOCHEMICAL PARAMETERS

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Abstract
The sago factory effluents had used as a source of water for irrigation purpose in several countries. Because, scarcity of water is becomes a crucial problem for cultivation of crop. In order to overcome this situation, we need to find out another source without infect the nature. So, the present study was conducted in order to find out the effect of sago factory effluents on rice cultivation. The 10 per concentration of sago factory effluent enhanced the seedling growth and dry weight. So, the effluent can be utilized for irrigation to cultivate the crops nearby factory areas after proper treatment. The paddy variety (PAIYUR-1) can be recommended for cultivation in the effluent irrigated area. By this way, we can prevent the soil and water pollution to some extent. We can also get the higher yield by irrigating this effluent as they contain some nutrients, which are beneficial for plant growth.

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1. Introduction
Rice (Oryza sativa) is one of the most important foods in world supplying as much as half of the daily calories of the world population. It is most important staple food after wheat in and is known as queen among cereals. In India, most of the population especially south Indian people depends rice for their daily food. But, the production and area under cultivation of rice was declined considerably recently. Scarcity of water for irrigation is considered as one of the major problems for rice cultivation. So, the alternative source for irrigation in crops. Among the effluents from sago factory contributes a pivotal position, because it is an agro - based industry. The utilization of waste water from sago industry after treatments for irrigation purpose has two fold benefits such as safest disposal of effluents as well as irrigation purpose. So, the present study was conducted in order to find out the effect of sago factory effluents on rice cultivation.

2. Materials and Methods
The treated effluent that comes out of the sago factory was analyzed. The treated effluent at different concentrations (10 %, 25 %, 50 %, 75 % and 100 %) was used for seed germination and for irrigation of paddy plants. The photochemical and
biochemical parameters such as protein, Total sugars and amino acid were assessed.

3. Result

The effect of sago factory effluents on photosynthetic and biochemical contents were observed and recorded.

Chlorophyll ‘a’, Chlorophyll ‘b’ and Carotenoid

The Chlorophyll ‘a’, Chlorophyll ‘b’, Total chlorophyll and Carotenoid content of baddy seedlings are furnished in Table - 1. The maximum amount of Chlorophyll ‘a’, Chlorophyll ‘b’, Total chlorophyll and Carotenoid was found at 10 per cent concentration of sago factory effluent (0.1065, 0.0934, 0.1999 and 0.8892 mg/g fr.wt.). The minimum pigment contents values (0.0578, 0.0421, 0.0994 and 0.5342 mg/g fr.wt.) were recorded in 100 per cent concentration of the effluent.

The effect of sago factory effluent on Protein, Total sugar and Amino acid content of baddy seedlings are presented in Table - 2.

Protein

The highest protein content of baddy seedlings (0.4426 and 0.4567 mg/g fr.wt. for root and shoot) was observed in 10 per cent concentration of sago factory effluent. The lower amount of protein content was (0.3026 and 0.2876 mg/g.fr.wt. for root and shoot) recorded at 100 per cent concentration of sago factory effluent concentration.

Total sugar

The maximum amount of Total sugar content of root and shoot of baddy seedling as recorded in 10 per cent concentration of sago factory effluent (8.4086 and 10.968 mg/g fr.wt. for root and shoot). The minimum amount of total sugar content was recorded in 100 per cent concentration of sago factory effluent (3.842 and 3.884 mg/g fr.wt for root and shoot).

Amino acid

The maximum amount of amino acid content of paddy seedlings (2.8966, 2.1946 mg/g fr.wt) was recorded in 5 per cent concentration of sago factory effluent. The minimum content (1.3468, 1.1484 mg/g fr.wt) was observed at 100 per cent concentration of sago factory effluent.

4. Discussion

Since the early seedling growth was found related to pollution stress, it was interesting to investigate some biochemical changes in Seedling stage. Reduction in germination and subsequent seedling growth due to effluent treatment, ultimately led to impairment in other physiological activities like chlorophyll pigments, carbohydrates (Starch, Total and Reducing sugars) and total protein synthesis (Manonmani et al., 1994). Sago factory effluent affected the seed germination, seedlings growth, fresh weight and dry weight of paddy seedlings at 10 per cent concentration. Among them, the variety (PAIYUR-1), for paddy was selected for further experiments to know the change in biochemical aspects under effluent irrigation.

The chlorophyll estimation is one of the most important of plant parameters which was used as an index of production capacity of the plant. In the present study, the lower concentrations (10 %, 25 %, 50 %, 75 % and 100 % of effluents promoted the chlorophyll content of paddy seeds up to 10 % per cent level effluent when compared to control. However, the chlorophyll content decreased at higher (beyond 10 %) concentrations. By this way, the increasing concentrations of the effluent have a toxic effect on plant chlorophyll biosynthesis. The increase in chlorophyll content at lower concentration of the sago factory effluent treatments may be due to the favorable effects of elements present in the effluent (Asharf and Khan, 1990; Madhappan, 1993).

The increase in protein content of seedlings at lower concentrations of sago factory effluents was observed. The highest protein content was recorded at 5 per cent of effluent concentrations might be due to absorption of most of the elements by plants. Similar trend was reported by Srivastava Neeta et al. (1988). The protein content was decreased with the increase in concentrations of sago factory effluent. It has been reported that the presence of high concentrations
of various cation and anions in the effluents suggests a close similarity in the changes induced by the effluents stress (Panda and Mishra, 1997).

The sugar content increased up to 10 per cent concentrations of sago factory and then the content decreased at higher concentrations. The same trend was observed in Arachis hypogaea due to dyeing factory effluent (Manonmani et al., 1992). The amino acid content increased at lower concentration up to 10 per cent and decreased at higher concentration of sago factory effluent. A decrease in amino acid at higher salinity has been reported in Pea and Tobacco (Joshi and Iyenger, 1982).

Table -1: Effect of factory effluent Chlorophyll ‘a’, Chlorophyll ‘b’, Total chlorophyll and Carotenoid contents of Paddy (Oryza sativa) seedling (mg/g.fr.wt.)

<table>
<thead>
<tr>
<th>Effluent concentration (%)</th>
<th>Sago factory effluent</th>
<th>Chlorophyll ‘a’</th>
<th>Chlorophyll ‘b’</th>
<th>Total chlorophyll</th>
<th>Carotenoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>0.0997±0.029</td>
<td>0.0887±0.026</td>
<td>0.184±0.056</td>
<td>0.7342±0.029</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0.1065±0.031</td>
<td>0.0934±0.028</td>
<td>0.1999±0.059</td>
<td>0.8892±0.035</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>0.0872±0.026</td>
<td>0.0721±0.021</td>
<td>0.1593±0.047</td>
<td>0.8112±0.032</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>0.0796±0.023</td>
<td>0.0642±0.019</td>
<td>0.1437±0.043</td>
<td>0.7432±0.022</td>
<td></td>
</tr>
<tr>
<td>75</td>
<td>0.0685±0.020</td>
<td>0.0521±0.015</td>
<td>0.1206±0.036</td>
<td>0.6231±0.018</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>0.0578±0.017</td>
<td>0.0421±0.008</td>
<td>0.0994±0.029</td>
<td>0.5342±0.016</td>
<td></td>
</tr>
</tbody>
</table>

Table – 2: Effect of sago factory effluent on protein, total sugar and amino acid content of paddy (Oryza sativa) seedling (mg/g.fr.wt.)

<table>
<thead>
<tr>
<th>Effluent Concentrate Ion (%)</th>
<th>Protein</th>
<th>Total sugar</th>
<th>Amino acid</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Root</td>
<td>Shoot</td>
<td>Root</td>
</tr>
<tr>
<td>Control</td>
<td>0.3967±0.0119</td>
<td>0.4122±0.0123</td>
<td>7.879±0.4727</td>
</tr>
<tr>
<td>10</td>
<td>0.4426±0.0177</td>
<td>0.4567±0.0137</td>
<td>8.4086±0.5045</td>
</tr>
<tr>
<td>25</td>
<td>0.3771±0.0113</td>
<td>0.3893±0.0116</td>
<td>7.410±0.446</td>
</tr>
<tr>
<td>50</td>
<td>0.3562±0.0106</td>
<td>0.3624±0.010</td>
<td>5.514±0.3308</td>
</tr>
<tr>
<td>75</td>
<td>0.3349±0.0100</td>
<td>0.3163±0.0948</td>
<td>4.478±0.2686</td>
</tr>
<tr>
<td>100</td>
<td>0.3021±0.0907</td>
<td>0.2876±0.0862</td>
<td>3.842±0.2304</td>
</tr>
</tbody>
</table>
5. References


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