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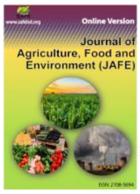

Original Article

Physico-chemical properties of digested rotten potato (*Solanum tuberosum*) used as a production medium of spirulina (*Spirulina platensis*)

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A B S T R A C T

The study was conducted to evaluate physico-chemical properties of digested rotten potato (*Solanum tuberosum*) used as a production medium of spirulina in sixteen days after twenty six days digestion. Three exclusive concentrations such as 20%, 40% and 60% of DRP (digested rotten potato) were used. Spirulina changed into inoculated in supernatant DRP for a period of 14 days. Light intensity (lux/m^2/s) was varied from 2725 ± 30, 2720 ± 32 and 2730 ± 34, respectively on first day to 2740 ± 30, 2780 ± 27 and 2694 ± 30, respectively on the last day in 20%, 40% and 60% DRPM. The pH values were 9.78 ± 0.07 to 9.95 ± 0.7 on 12th day in supernatant of 20% DRPM after which it turned into reduced to 9.77 ± 0 on ultimate day of experiment. Its change was observed 9.82 ± 0 to 9.90 ± 0 on 10th day of experiment of 40% DRPM. The electric conductivity was from 11.22 ± 0.10 to 14.74 ± 0.99, 11.54 ± 0.27 to 14.74 ± 0.99 and 11.23 ± 0.31 to 11.12 ± 0.47 on the 20%, 40% 60% DRPM, respectively. The salinity was 8.10 ± 0.70 in the 20% DRPM. The salinity was 5.17 ± 0 to 6.06 ± 0.26, 6.26 ± 0.17 to 7.60 ± 0.56, whilst spirulina cultured in supernatant of 60 % and 40% DRPM, respectively. The temperature and DO were also fluctuated with variation of DRPM concentration that affects the production of spirulina. The physico-chemical properties of 60 % DRPM was more suitable for spirulina culture.

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Introduction

Bangladesh is the largest active deltaic country of the sector. It produced 43.84 lakh MT fish in the year 2018-19 (DoF, 2020). Live food is very important for fish and shrimp hatchery (Mahmuda *et al*., 2020). Aquaculture is the fastest-growing food production sector in the world. It provides half of the global fish supply. It's far critical to advise the maximum acceptable feed for financial manufacturing of fish (Nasrin *et al*., 2021). Fish manufacturing via aquacultures swiftly gaining significance due to increasing human population and diminishing herbal fisheries resources in Bangladesh. But fish culture on a small scale basis has often been failed due to inadequate knowledge about fish culture technique and lack of knowledge about live food culture (Mahmud *et al*., 2021). Spirulina is a multi-cellular, blue-green algae. They are very small and microscopic and 300-500µm in diameter Sizeable quantities of phosphorous, magnesium, zinc and pepsin found in spirulina. The cell wall of spirulina consists of polysaccharide which has 86% digestibility and could be effortlessly absorbed in human frame (Li., 1995). Many elements are critical for the producing of spirulina at massive scale of which most vital are nutrient availability, temperature and slight intensities. The filamentous cyanobacteria which include spirulina are determined to be most well proper microorganisms for the utilization of waste and waste water as they're able to produce massive quantity of biomass and their harvesting is likewise notably clean due to their shape. Also those wastes reduce the fee of nutrient medium and act as a source of reasonably-priced nutrient medium for cultivation of spirulina. Enterprise genesis of spirulina may be made charge effective by way of lowering the input cost with penny and effectively to be had materials without sacrificing the manufacturing performance. After taking 10g spirulina pills in step with day for four weeks, girl athletes confirmed boom of their homo chrome stage, whereas the male athletes did no longer display any obvious boom but lung capacity of teenagers weight lifting and jujutsu athletes emerge as improved. The spirulina tablet had no impact on blood pressure (Gerald *et al*., 1983). Spirulina should function an auxiliary cure for plenty diseases which have shown through clinical trends. Spirulina is a spiral-fashioned, blue-inexperienced microalgae that grows evidently in the wild in alkaline lakes, sea water and saltwater. Its deep blue-inexperienced shade what gives the water its greenish colorations. With the enlargement of aquaculture in Bangladesh, there has been a growing fashion in the use of chemical compounds in aquatic animal health management (Uddin *et al*., 2020). Spirulina is beneficial for fish health. We will use spirulina in place of the use of chemical in aquaculture. Spirulina has been fed on from a completely long time in lots of components of the sector as a meals complement for human as well as animals in various office works like wholesome drink, pills and powder so on. Because of its alimentary value.

Microalgae play a critical position in oxygen in addition to carbon dioxide stability in the water.

It acts not only on agro-chemical but moreover animal wastes as properly via converting them into food substances. As why spirulina offers: about 60% complete digestable protein, round 6-10 % lipids, micro-nutrients, macro-vitamins and masses of different trace elements (Hossain *et. al.,* 2021). It consists of every vital amino acid, contains greater carotenoids than every other complete meals and this is an extraordinary source of vitamins A, K, B1, B2, B12 and iron, manganese, chromium and many others (Becker 2007). It performs a treasured function in mind features further to regular growth and improvement (Hossain *et al*., 2021). In food industries it plays diverse competencies as a thickener, binder, disrupting agent, stabilizer, texture modifier, gelling and a bulking agent, beneficial within the maintenance of canned and frozen food, in the machine of syrups, essences 1423 and drinks, in confectionery and bakery, snacks, and mushroom allows (Burrell *et al*., 2003). Therefore, to boost up the development of aquaculture industry, it's miles essential to manner of lifestyles spirulina. The ultimate reason of this test changed into to extend low rate media for huge scale manufacturing of spirulina. The ones rotten potatoes or spoiled potato are thrown as waste material outside which decomposes and creates environmental dangers. But it contains immoderate damaged natural and inorganic nutrients, general dissolved solids, trendy suspended solids, nitrate, phosphate and additionally inorganic nutrients the ones are crucial elements for algae way of life (Habib, 1998). Those organic and inorganic vitamins rich in carbon can help to increase *S. platensis* in supernatant after aerobic or anaerobic digestion of potatoes. Potato has the suitability and efficacy as prebiotic compound at the boom performance and survival price of fish (Islam *et al*., 2020). Therefore, the prevailing paintings was undertaken to take a glance about physic-chemical residences of supernatant of digested rotten potato (*Solenum tuberosum*) which might be essential for *S. platensis* production.

Materials and methods

Study area

It was executed within the Laboratory of Fish Nutrition, Department of Aquaculture, Water Quality Laboratory inside the Department of Fisheries management and Genetics Laboratory in the department of Fisheries Biology and Genetics, faculty of Fisheries, Bangladesh Agricultural college, Mymensingh-2202.

Collection of rotten potato

The rotten potato come to be selected as medium for *S. platensis* way of life due to presence of excessive herbal similarly to inorganic vitamins specifically carbohydrate. The rotten potato becomes gathered from Seshmore market place, BAU, Mymensigh. It became reduce into quantities and used to digest in cardio condition, some detail grow to be dried, ground, packed in polythene bag and saved in the laboratory for destiny use. Distinctive concentrations of digested rotten potato were used for analysis (Plate 1).

Analyses of proximate composition of rotten potato

The proximate composition of rotten potato (RP) including moisture, crude protein, crude lipid, ash and nitrogen free extract (NFE) have been analyzed in triplicates following the same old techniques (Horwitz, 1984) in the Fish Nutrition Laboratory, Department of Aquaculture, BAU, Mymensingh. The analyses were done following the methods given below:

Moisture

The pulverized samples of RP and spirulina were weighed in a previously dried and pre-weighed small crucible in triplicates. The crucible with samples was kept for 24 hrs in oven at 105°C. The overnight dried samples with crucible then were transferred in a desiccator in the following morning. After cooling at room temperature, these were weighed out in a sensitive balance. The percentage of moisture of the samples was calculated using the following equation:

$$\%\ moisture = \frac{X - Y}{X} \times 100$$

Where, X = Weight of sample before drying in g; and
Y= Weight of sample after drying in g

Crude protein

Crude protein of dried samples of RP and spirulina were estimated by using Kjeldhal Auto 1030 Analyzer. A sample of 0.5 g and a blank were digested in the digestion tube. 10 ml of concentrated sulphuric acid, 2.0 ml of H_2O_2 and one kjeldhal tablet were added in the tubes and mixed gently by electric mixer. Then the digestion tubes were set in digestion chamber fixing at 420°C for 45 mins making sure water deliver, simpler gas shops and so on. After digestion, the tubes were allowed to chill and seventy five ml of distilled water turned into brought in each tube. 50 ml of 40% NaOH become brought earlier than titration. After titration with 1% boric acid and 0.2 N HCl the studying for the samples and clean have been recorded to calculate the proportion of protein of the specified samples the use of the following formula:

$$\%\ \text{Nitrogen} = \frac{\text{Milli equivalent wt. of N} \times \text{ml of titrant} \times \text{strength of HCI}}{\text{Sample weight(g)}} \times 100$$

For animal, % Protein = % Nitrogen x 6.25; and
For plant, % Protein = % Nitrogen x 5.85

Crude lipid

To determine lipids were used for solvent extraction of dry samples of RP and spirulina using Soxhlet apparatus. 2.0 g dried samples had been taken into extraction thimbles to place into the extraction unit along with the weighed extraction cups having 50 ml of solvent as acetone for 3.0 hours at boiling point. After evaporation of the solvent, the cups were released and dried in the oven for 30 minutes. The percentage of crude lipid was determined using the following equation (Islam *et al*., 2020):

$$\%\ \text{Lipid} = \frac{\text{Weight of cup with lipid} - \text{initial weight of cup}}{\text{weight of sample(g)}} \times 100$$

Ash

The pre-weighed crucible containing dried samples from the moisture determination was pre-ashed and then put into a muffle furnace at 550°C for 6.0 hrs. The crucible containing ash was cooled in a desiccator and weighed to find out the ash percentage as follows:

$$\%\ \text{Ash} = \frac{\text{Weight of ash with pre weighed crucible} - \text{weight of crucible}}{\text{weight of dried sample}} \times 100$$

Analysis of physico-chemical properties of DRP

Physico-chemical properties of DRP have been analyzed using different chemicals and equipments. These properties such as pH, total suspended solids, total dissolved solids, total alkalinity, nitrate-N (NO_3-N) and phosphate-P (PO_4-P) of DRP have been analyzed in the laboratory of Live Food Culture, Fish Nutrition Laboratory and Water Quality Laboratory of the Faculty of Fisheries, BAU, Mymensingh. All of these properties were analyzed using the procedures which were as follows:

pH

pH of digested samples of DRP was determined using pH meter (Model HI 98129, HANNA).

Total suspended solids (TSS) and total dissolved solids (TDS)

50 ml digested DRP was filtered through pre-weighed filter paper of mesh size 0.45 µm. The filtered water was taken in pre-weighed crucible, and then filter paper and crucible with water were put in oven at 105°C overnight. Then the dried filter paper and crucible were taken out from the oven after switched off, put in the desiccator and kept for at least 15 minutes for cooling.

The TSS became calculated using the subsequent equation:

TSS (mg/l) = (Final weight of filter paper - initial weight of filter paper)/Volume of DRP; and

TDS (mg/l) = (Final weight of crucible - initial weight of crucible)/Volume of DRP

Alkalinity

1.0 ml of DRP (because to high concentration) was taken in the 20 ml plastic bottle and then mixed with 1 drop Bromophenol blue. The colour of the answer turned into blue and then titrated with acid solution (HI 3811-0 reagent) until the color became yellow (end point). The total amount of titrant was recorded and total alkalinity was recorded by following formula:

Alkalinity (mg/l) = Total amount of titrant (ml) x 300

Nitrate-N (Available-N)

Ten ml of filtered (Sartorius filter paper, 0.45 µm) DRP was taken in the cuvette and mixed with Nitrate HR reagent. It was then agitated to mix thoroughly for 1.0 minute and put in the machine (LR Phosphate, Model HI 93713, HANNA). The machine was on and data was read after 4.0 minutes at 660 nm.

Phosphate-P (Available-P)

10 ml of filtered (Sartorius filter paper, 0.45 µm) DRP was taken in the cuvette and mixed with Phosphate HR reagent. It was then agitated for at least 30 seconds to mix thoroughly and put in the machine (LR Nitrate, Model HI 93713, HANNA). The machine was on and data was read after 2.0 minutes at 880 nm.

Analysis of physico-chemical parameters of cultured media

Physical parameters

The bodily parameters (temperature and light intensity) of the lifestyle media have been recorded as follows:

Temperature

Water temperature (°C) of the tradition media became measured during the time of sampling day by a celsius thermometer.

Light intensity

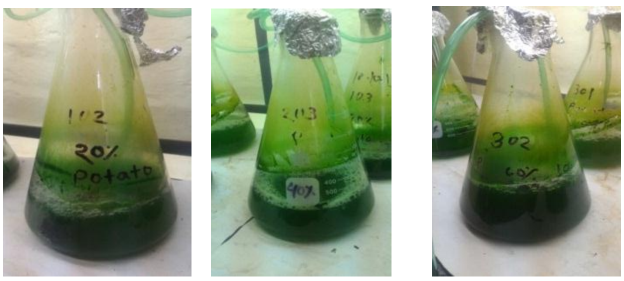
Light intensity (lux/m^2/s) was measured during sampling day by using a lux-meter [digital instrument, Lutron (LX-101)].

Chemical parameters

The chemical parameters such as pH, alkalinity, nitrate-N and phosphate-P of the subculture media have been recorded following the methods given through Clesceri *et al*. (1989) within the laboratory.

Statistical analysis

Analysis of variance (ANOVA) of mean crude protein, crude lipid and ash of *S. platensis* cultured in different media were done. To find whether there is any significant difference among treatment means was done by Duncan's Multiple Range Test (DMRT) using statistical package following Zar (1984).



(a) (b) (c)

Plate 1. (a) 20% DRPM , (b) 40% DRPM and (c) 60% DRPM

Results and Discussion

Physico-chemical characteristics of rotten potato

Colour, Odour and Structure:

The colour of the rotten potato was reddish white with little bit bad sour (odour). The structure was almost semi-solid (Table 1).

Temperature (°C)
Temperature of rotten potato was little bit better than normal ambient temperature. It was ranged from 29.5 to 30°C (Table 1).

Total solids (TSS + TDS)
Total soild is the addition of general suspended solids and general dissolved soilds of liquid of rotten potato which changed into ranged from 1638 to 1738 mg/L (Table 1).

pH
pH of liquid of rotten potato was ranged from 7.5 to 7.75 which changed into alkaline in nature (Table 1).

Alkalinity
Alkalinity of liquid rotten potato was quite high and ranged from 316 to 345 mg/L (Table 1).

Nitrate-N (NO_3-N)
Nitrate-N (Available-N) of liquid rotten potato was ranged from 1.40 to 1.50 mg/L (Table 1).

Phosphate-P (PO_4-P): Phosphate-P (Available-P) of liquid rotten potato was high and varied from 4.40 to 5.20 mg/L (Table 1).

Table 1. Characteristics of liquid rotten potato after collection.

Sl. No.	Characteristics of rotten Potato	
1	Colour	Whitish
2	Odour	Bad Smell
3	Structure	Semi-Solids
4	Temperature	29.5-30°C
5	pH	7.5-7.75
6	Total solids (TSS + TDS)	1638-1738 mg/L
7	Alkalinity	312-345 mg/L
8	Total-N	2.16-2.30 mg/L
9	Available-N (NO_3-N)	1.40-1.50 mg/L
10	Available-P (PO_3-P)	4.40-5.20 mg/L

Physico-chemical properties of supernatant of digested rotten potato
Temperature (°C)
Temperature of supernatant of digested rotten potato (DRP) used to culture Spirulina was varied from 27.30 to 27.50ºC (Table 2).

pH
pH of supernatant of DRP used for Spirulina culture was found to range from 7.30 to 7.70 (Table 2).

Total solids (TSS + TDS)
Total solids (TSS + TDS) of supernatant of DRP used to culture Spirulina was reduced due to decomposition which was ranged from 248 to 265 mg/L (Table 2).

Alkalinity
Alkalinity of supernatant of DRP used to culture Spirulina was high which was ranged from 180-195 mg/L (Table 2).

Nitrate-N (NO_3-N)
Nitrate-N (Available-N) of supernatant of DRP used for *Spirulina* culture was also high in amount and varied from 2.50 to 2.70 mg/L (Table 2).

Phosphate-P (PO_4-P)
Phosphate-P (Available-P) of supernatant of DRP used to culture Spirulina was very high and found to vary from 4.10 to 4.20 mg/L (Table 2).

Total-N
Total-N of supernatant of DRP used for *Spirulina* culture was found also high in amount and ranged from 1.90 to 2.70 mg/L (Table 2).

Table 2. Physico-chemical properties of supernatant of digested rotten potato after 30 days digestion in aerobic condition.

Sl. No.	Properties of rotten potato	
1	Temperature	27.30-27.50°C
2	pH	7.30-7.70
3	Total solids (TSS + TDS)	248-265 mg/L
4	Alkalinity	180-195 mg/L
5	Total-N	1.90-2.20 mg/L
6	Available-N (NO_3-N)	2.50-2.70 mg/L
7	Available-P (PO_3-P)	4.10-4.20 mg/L

Table 3. Proximate composition (%) of rotten potato on moisture and dry weight basis.

Composition	Moisture basis (%)	Dry basis (%)
Moisture	80.0	10.0
Crude protein	2.25	11.0
Crude lipids	1.75	8.0
Ash	3.25	16.20
Crude fiber	3.90	19.50
NFE*	9.28	36.55

*NFE (Nitrogen Free Extract) = 100 - (Moisture + Crude protein + Crude lipids + Ash).

Light intensity
It was varied slightly in different days in all the four culture media (Fig. 1). However, light intensity (lux/m^2/s) was varied from 2725 ± 30 on first day to 2740 ± 30 lux/m^2/s on the last day with slight variation in other days when spirulina grown in supernatant of 20% digested rotten potato media (DRPM) (Fig. 1). It was varied from 2720 ± 32 on first day to 2780 ± 27 lux /m^2/s on the last day of experiment when spirulina cultured in supernatant of 40% DRPM (Fig. 1). Similarly, it was observed 2730 ± 34 on the first day and 2694 ± 30 on the last day (12th day) of experiment when spirulina grown in supernatant of 60% DRPM (Fig. 1). Light intensity was found to be 2730 ± 25 lux /m^2/s on first day when spirulina grown in Kosaric medium and 2700 ± 16 lux /m^2/s on the last day (14th day) of experiment (Fig. 1). Zarrouk (1996) is the pioneer in detailed study on the response of *S. platensis* to light. In his simple experiment, he reached a conclusion that the highest growth of *S. platensis* was saturated at the level of 25-30 Klux/m^2 /s. The highest growth of *S. platensis* in the present study is found at light intensity of 2710 lux/m^2 /s and 2740 lux/m^2 /s at 5 g/L concentration of the media and KM on the 10th day of culture. This variation might be due to difference in space and difference of light source.

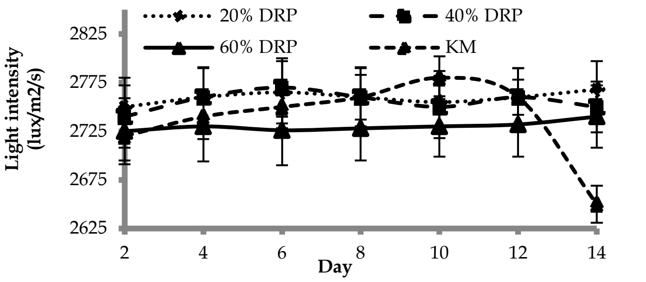


Fig. 1. Mean values of light intensity (Lux/m^2/s) during culture of *Spirulina platensis* in supernatant of three different digested rotten potato, and Kosaric medium. Vertical bars represent standard errors.

Temperature

Temperature around culture media was higher than the ambient temperature due to light intensity. The temperature (°C) of all the culture media was varied with slight ineffective fluctuations (Fig. 2). The trends of variation of temperature are shown in Fig. 2. However, the temperature around the culture of supernatant of 20% digested rotten potato media (DRPM) was found 26.03 ± 12°C (lowest) on the first day to 26.8 ± 0.10°C at the end (14th day) of experiment with slight up on 4th, 6th, and 8th day of experiment (Fig. 2). It was also follow the similar trend of fluctuation from first to last day of experiment when spirulina cultured in supernatant of 40% DRPM (Fig. 2) and 60% DRPM (Fig. 2). But, it was recorded 26.03 ± 0.12°C on the first day of experiment to 30.60 ± 0.29°C at the end of experiment when spirulina grown in Kosaric medium (Fig. 2).

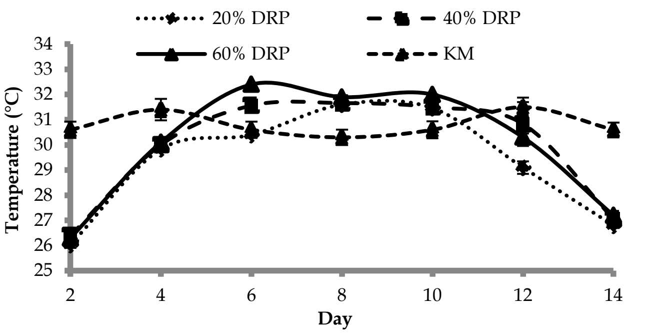


Fig. 2. Mean values of temperature (°C) during culture of *Spirulin platensis* in supernatant of three different digested rotten potato, and Kosaric medium. Vertical bars represent standard errors.

pH

The pH values were above 8.4 in all the media which were highly alkaline suitable for spirulina culture. The trends of fluctuation pH are shown in Fig. 3. During the 14 days experiment, it was increased from 9.78 ± 0.07 on first day to 9.95 ± 0.7 on 12th day of experiment when spirulina cultured in supernatant of 20% digested rotten potato media (DRPM) and then it was decreased to 9.77 ± 0 on last day (14th day) of experiment (Fig. 3). It was found 9.82 ± 0 on the first day which was increased to 9.90 ± 0 on 10th day of experiment when spirulina grown in supernatant of 40% DRPM and then decreased and increased on 10th day and again increased on the last day (14th day) of experiment (Fig. 3). Similar trend of fluctuation of pH observed when spirulina cultured in supernatant of 60% DRPM (Fig. 3). But it was increased from first day (9.75 ± 0) of experiment and (9.93 ± 0) on (12th day) of the experiment, and then decreased on the last day (14th day) of experiment when spirulina grown in Kosaric medium (Fig. 3).

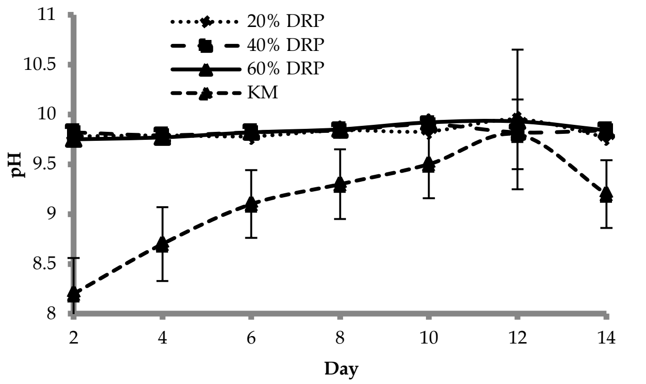


Fig. 3. Mean values of pH of culture during *Spirulina platensis* in Supernatant of three different digested rotten potato, and Kosaric medium. Vertical bars represent standard errors.

Dissolved Oxygen

The dissolved oxygen were above 5.77 (mg/L) in the 40% concentration in 2nd day and highest are 8.34 (mg/L) in the 60% concentration in 12th day. The trends fluctuations of dissolved oxygen are shown in Fig. 4. During the 14 days experiment, it was increased from 6.28±0.27 on first day to 8.34 ± 0.07 this was the last day of the experiment when spirulina cultured in supernatant of 60% digested rotten potato media (DRPM) and it was decreased to 7.42 ± 0.18 during the culture of 20% digested rotten potato media in 2nd day (Fig. 4). It was found 5.77 ± 0.28 on the first day which was increased to 8.29 ± 0 on 14th day of experiment when spirulina grown in supernatant of 40% DRPM and then decreased and increased on 10th day and again increased on the last day (14th day) of experiment (Fig. 4). Similar trend of fluctuation of dissolved oxygen observed when spirulina cultured in supernatant of 60% DRPM (Fig. 4). But it was increased from first day (8.37 ± 0.31) of experiment and (9.93 ± 0) on (14th day) of the experiment when spirulina grown in Kosaric medium (Fig. 4).

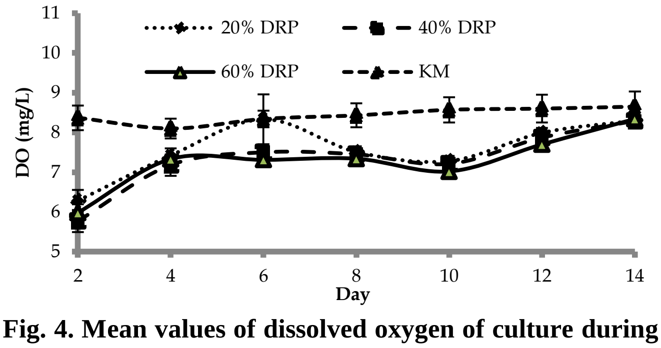


Fig. 4. Mean values of dissolved oxygen of culture during *Spirulina platensis* in Supernatant of three different digested rotten potato, and Kosaric medium. Vertical bars represent standard errors.

Salinity

The salinity was above 8.10 ± 0.70 in the 20% concentration in 8th day (Fig. 5). The trends fluctuations of salinity concentration are in the figure. During the 14th days experiment it was increased from 5.17 ± 0 on first day of the experiment to 6.06 ± 0.26 on the last day of the experiment (Fig. 5) when spirulina cultured in supernatant of 60% digested rotten potato media (DRPM). It was found 6.26 ± 0.17 on the first day which was increased to 7.60 ± 0.56 on

10th day of experiment when spirulina grown in supernatant of 40% DRPM and then decreased and increased on 10th day and again increased on the last day (14th day) of experiment (Fig. 5). Similar trend of fluctuation of salinity observed when spirulina cultured in supernatant of 60% DRPM (Fig. 5). But it was increased from first day (4.99 ± 0.12) of experiment and (7.29 ± 0.41) on (10th day) of the experiment, and then decreased on the last day (14th day) of experiment when spirulina grown in Kosaric medium (Fig. 5).

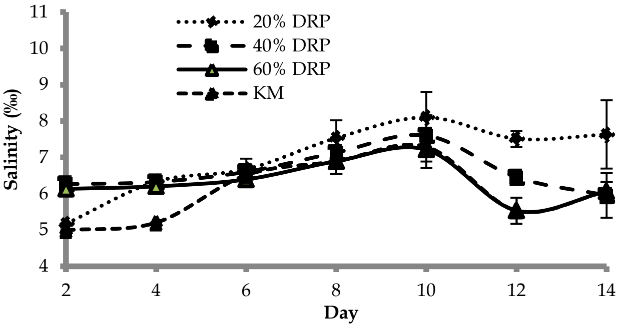


Fig. 5. Mean values of salinity of culture during *Spirulina platensis* in Supernatant of three different digested rotten potato, and Kosaric medium. Vertical bars represent standard errors.

Electric Conductivity

The electric conductivity was above 14.74 ± 0.99 in the 40% concentration in 8th day. The trends fluctuations of electric conductivity are shown in the figure. During the 14th days experiment it was increased from 11.22 ± 0.10 on first day of the experiment to 14.74 ± 0.99 on the 40% concentration and 14.12 ± 0.91 in 60% concentration on the 8th day of the experiment in supernatant of 60% digested rotten potato media (DRPM). It was found 11.54 ± 0.27 on the first day which was increased to 14.74 ± 0.99 on 10th day of experiment when spirulina grown in supernatant of 40% DRPM and then decreased and increased on 10th day and again increased on the last day (14th day) of experiment (Fig. 6). Similar trend of fluctuation of electric conductivity observed when spirulina cultured in supernatant of 60% DRPM (Fig. 6). But it was increased from first day (11.23 ± 0.31) of experiment and (11.12 ± 0.47) on (14th day) of the experiment, and then decreased on the last day (14th day) of experiment when spirulina grown in Kosaric medium (Fig. 6).

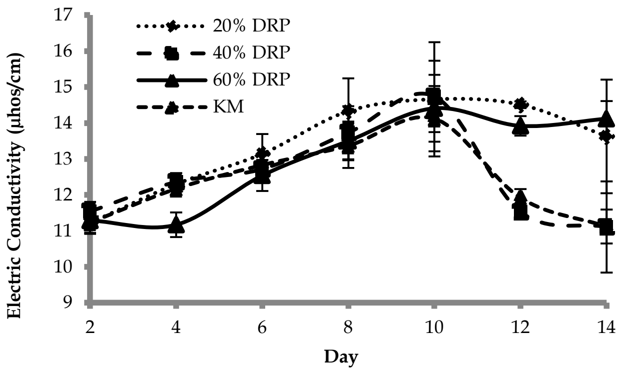


Fig. 6. Mean values of electric conductivity of culture during *Spirulina platensis* in Supernatant of three different digested rotten potato, and Kosaric medium. Vertical bars represent standard errors.

Proximate composition (%) of spirulina (*S. platensis*)

Moisture

Moisture of Spirulina grown in the supernatant of three exceptional digested rotten potato and Kosaric medium became various from 8.22 to 8.24 % (Table 4). The moisture content (%) turned into appropriate for the protection of the samples for destiny evaluation.

Crude protein

There has been no massive variant the various crude protein of Spirulina grown in the supernatant of three specific digested rotten potato media (DRPM) (Table 4). But, crude protein of Spirulina cultured in Kosaric medium (58.70 ± 0.50%) was significantly ($p < 0.01$) higher than that of Spirulina grown in the supernatant of three other DRP media. The percentage of crude protein of Spirulina was 52.12 ± 0.50, 55.15 ± 0.45 and 51.14 ± 0.60 when grown in the supernatant of 20%, 40% and 60% DRPM.

Crude lipid

Crude lipid (%) of *Spirulina* cultured in the supernatant of 40% digested rotten potato media (DRPM) (17.25 ± 0.30%) varied significantly ($P < 0.01$) from that of spirulina grown in the supernatant of 20% DRPM (14.30 ± 0.25%) and 75% DRPM (13.15 ± 0.22%) followed by Kosaric medium (6.33 ± 0.15%) (Table 4). There was no vast difference of crude lipid of spirulina while cultured in the supernatant of 20% and 60% DRPM.

Ash

Ash (%) of Spirulina grown in the supernatant of 60% digested rotten potato media (DRPM) (11.20 ± 0.30%) had significant ($P < 0.01$) difference from that of Spirulina cultured in the supernatant of 40% DRPM (11.30 ± 0.21%) and 20% DRPM (10.30 ± 0.20%), and Kosaric medium (13.55 ± 0.15%) (Table 4). There has been no considerable ($p > 0.01$) distinction a few of the ash of Spirulina grown within the supernatant of 20% DRPM and Kosaric medium.

Nitrogen free extract (NFE) of spirulina

Nitrogen free extract (%) of spirulina cultured in the supernatant of 20% DRPM (13.84 ± 0.40%) and 60% DRPM (15.02 ± 0.30%) varied significantly ($p < 0.01$) from that of spirulina grown in Kosaric medium (12.10 ± 0.30%) and then 40% DRPM (7.35 ± 0.10%) (Table 4). There has been no full-size version among the NFE of spirulina grown in the supernatant of 20% and 60% DRPM.

Crude fibre

Very small quantity of crude fibre (%) was determined in spirulina grown inside the supernatant of three extraordinary digested rotten potato media (DRPM), and Kosaric medium (Table 4). However, it was varied from 0.71 ± 0.03% when spirulina grown in the supernatant of 40% DRPM to 0.72 ± 0.04% when cultured in the same of 60% DRPM.

Table 4. Proximate composition (% in dry matter basis) of *Spirulina platensis* cultured in supernatant of three different concentrations of digested rotten potato media (DRPM), and Kosaric medium as control.

Treatments	T_1 (20% DRPM)	T_2 (40% DRPM)	T_3 (60% DRPM)	T_4 (KM)
Moisture	8.24 ± 0.09	8.22 ± 0.08	8.23 ± 0.07	8.22 ± 0.08
Crude Protein	52.12 ± 0.50[c]	55.15 ± 0.45[b]	51.14 ± 0.60[c]	58.70 ± 0.50[a]
Crude Lipids	14.30 ± 0.25[b]	17.25 ± 0.30[a]	13.15 ± 0.22[b]	6.33 ± 0.15[c]
Ash	10.30 ± 0.20[b]	11.30 ± 0.21[b]	11.20 ± 0.30[b]	13.55 ± 0.15[a]
NFE*	13.84 ± 0.40[a]	7.35 ± 0.10[c]	15.02 ± 0.30[a]	12.10 ± 0.30[b]
Crude Fibre	0.70 ± 0.04	0.71 ± 0.03	0.72 ± 0.04	0.71 ± 0.03

*NFE (Nitrogen Free Extract) = 100 - (Moisture + Crude protein + Crude lipids + Ash). Figures in common letters in the same row do not differ significantly at 1% level of probability.

Conclusion

The observe changed into performed to assess physico-chemical houses of digested rotten potato (*Solanum tuberosum*) used as a manufacturing medium of spirulina (*Spirulina platensis*) in sixteen days after 26 days digestion. Three exclusive concentrations consisting of 20, 40 and 60% of DRP (digested rotten potato) were used. Physico-chemical parameters of the subculture media viz., light intensity, temperature, pH, dissolved oxygen, salinity, and electric powered conductivity have been decided at every alternative day.

Rotten potato may be used to grow spirulina because of presence of organic carbon as carbohydrate in potato. Spirulina grows well in supernatant of 60% digested rotten potato due to favorable physico-chemical properties which is equivalent to the growth of spirulina in Kosaric medium. So, the supernatant of 60% digested rotten potato must be used to develop spirulina. Environment may be free from pollutants because of use of rotten potato. So, there's a large danger of huge scale rotten potato can be used to commercial subculture of spirulina and marketed as stay food for the good production and control of fish health.

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