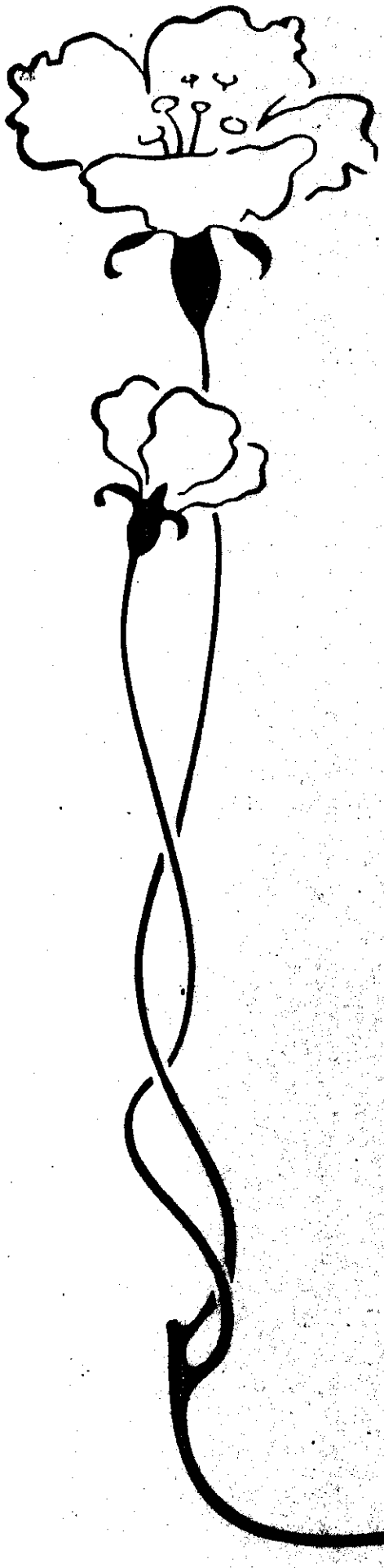

Summary

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The utilization of the algal biomass as a fish food supplement will partially offset the cost and make this process economically feasible. The present study included the nutritional quality of ***Chlorella vulgaris*** as a source of dietary protein.

The following results were obtained:

I- Indoor Experiments

1- Growth response of *Chlorella vulgaris* at different media:

The results show clearly that the Bold's Basal medium (BBM) increased the growth of ***Chlorella vulgaris***, represented as dry weight gain , cell numbers and chlorophyll " a" content a phenomenon that was highly intensified at the end of incubation period (8 days). At Chu no. 10 medium highly significant drop in chlorophyll "a" accumulation was displayed, reaching high significantly difference at 4 days. The dry weight gain was positively correlated with the count of ***Chlorella*** cells and with the chlorophyll "a" content.

2- Growth response of *Chlorella vulgaris* to various pH values:

Growth of ***Chlorella vulgaris*** after 8 days incubation showed that, pH 7 proved to be the most agreeable pH value to that strain. The algal yield as milligrams of dry weight, cell number per ml and accumulation of chlorophyll "a" were increased by aging of culture in all pH values cultures. However, the growth was more intensive at 6 days incubation periods. The acceptable pH levels fell between 6-8 in culture of ***Chlorella vulgaris*** which show highly growth expressed as dry weight gain, cell number and chlorophyll "a" content.

3- Growth response of *Chlorella vulgaris* to various photoperiods:

Growth of ***Chlorella vulgaris*** in continuous light was more intense than other photoperiod cycles (10/14, 14/10 and 18/6 hours light/dark cycles), which recorded maximum production during the period of 4 days of culture age. Production of dry matter, cell count as well as chlorophyll "a" accumulation showed maximum production in continuous light at 4 days incubation periods which showed significant difference.

4- Growth response of *Chlorella vulgaris* to various light intensities:

The growth of the organism represented as dry weight gain, cell number and chlorophyll "a" content were increased by aging of culture in all light intensities used (3000, 5000, 7000, 9000 and 12000 lux). At 3000 lux the amount of dry weight, cell numbers and chlorophyll "a" content were increasing until the end of incubation periods. It is also obvious that these parameters recorded their highest values at 12000 lux and reached maximum after 6 days incubation which shows high significantly differences

5- Growth response of *Chlorella vulgaris* to various temperature degrees:

Regarding the effect of different temperature degrees, at 25 °C the growth of ***Chlorella*** was faster than in lower temperature (15 °C) and it recorded higher dry weight, cell number as well as chlorophyll "a" content during the course of culturing time. The relative high temperature (35 °C) led to a depression in growth of ***Chlorella*** cells indicated as low dry weight, cell number as well as chlorophyll "a" content. Growth of ***Chlorella vulgaris*** at 20 °C was more intense than other temperatures degree, which recorded maximum production during the period of 6 days of culture age which showed significantly difference.

II-Algal Culture (Mass Production) of *Chlorella vulgaris* in Outdoor Cultivation:

After mass-culture cultivation, the moisture and crude protein contents of the algal biomass were 5.1 and 45.6 respectively. The total level of the 18 amino acids separated amounted to 87.2 g / 16 g N. The amino acid profile of the algal biomass was well-balanced, except that the level of sulfur-containing amino acids was low.

III-Outdoor Experiments:

1- Growth response of *Chlorella vulgaris* at different fertilizers with tap water:

The data recorded maximum growth at 6 days of incubation in cultures of OI medium, expressed as gain in dry weight, cell count, synthesis of chlorophyll "a" in ***C. vulgaris*** cells. Cultures of urea-N and combinations of urea-N and super phosphate had better growth than that of other fertilizers and were increasing during the culture time of experiment (8 days).

2- Growth response of *C. vulgaris* at different nitrogen sources of media of outdoor cultures:

By comparing the growth of ***C. vulgaris*** in cultures containing different nitrogen sources, growth increased at ammonium sulfate + urea after 6th days incubation giving the highest values of all treatments, sodium nitrate supplemented to algal cultures induced a significant increase in the growth of ***C. vulgaris*** after 8 days incubation. The dry weight gain, cell count as well as accumulation of chlorophyll "a' were progressively increased in medium containing ammonium sulfate + urea at 6 days incubation periods, while in cultures containing sodium nitrate or potassium nitrate were increasing during culture time up to the end of incubation periods (8 days).

3- Growth response of *C. vulgaris* at different lines of aeration:

The growth of ***C. vulgaris*** in high air flow rates (4 delivery air lines) expressed as the gain in dry weight, cells count and synthesis of chlorophyll "a" increased, a phenomenon that was furthered to reach maximum at 6 days of incubation. However, the growth of the organism in low air delivery lines (1 and 2 air delivery lines) was increasing up to the end of culture time (8 days).

IV- Silver Carp Feeding Experiment:

The feeding experiment in which artificial fish food supplemented with 20% dried algal cells (A_{20}) grown in mass culture supported much better growth, better (lower) food conversion ratio (FCR) and better (higher) specific growth rate (SGR) of the silver carp than the artificial fish food (AF) and other feeding treatments. The protein content of experimental fishes grown in the same treatment (A_{20}) had highest protein content, lowest fat content and better growth of the silver carp than that of experimental fishes grown in artificial fish food (AF).