Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 2546-2548
Received: 04-05-2019
Accepted: 06-06-2019

Jain Padma
Indore Institute of Pharmacy, Indore, Madhya Pradesh, India

Sharma Nayany
Indore Institute of Pharmacy, Indore, Madhya Pradesh, India

Sontakke Rupali
Indore Institute of Pharmacy, Indore, Madhya Pradesh, India

Dr. Mishra Dinesh
Indore Institute of Pharmacy, Indore, Madhya Pradesh, India

Correspondence
Jain Padma
Indore Institute of Pharmacy, Indore, Madhya Pradesh, India

Biological perk for optimum health: Chlorella

Jain Padma, Sharma Nayany, Sontakke Rupali and Dr. Mishra Dinesh

Abstract
Since ancient time chlorella is used as an alternative medicine, in far East. It is a green cellular freshwater microalgae and is widely sold as a food supplement, health supplement and nutraceutical due to its content full of nutrients and having more efficacious effects. There are various species of chlorella found like *Chlorella vulgaris*, *Chlorella pyrenoidosa*, *Chlorella prothothecoidis* amongst which *C. vulgaris and C. pyrenoidosa* are not considered in EU but *C. protothecoides* was recognised as safe under USFDA. Chlorella is rich in proteins, vitamins, minerals, and dietry fibres and labelled as SUPERFOOD, it includes benefits in boosting antibody count, promoting weight loss, improving Immune system health, in detoxification of body and fighting with Cancer Side Effects as it has antioxidant activity. Irrespective of its hard shell it has a high nutritive value, inorder to digest it has to be taken as supplement to reap its benefit [1].

Keywords: Chlorella, detoxification, food supplement, nutraceutical

Introduction
Algae are considered as the vast and the diverse group of organism ranging from single celled micro algae to the form of algae grow in sea and in the form of kelp. Nowadays micro algae are promoted as Superfoods and marketed majorly in dietary supplements. These are tempeted to sell as a virtue to cure-alls, to improve cardiovascular, gastrointestinal, cognitive and immunological health etc. also they reduces the skin wrinkling and the signs of ageing.
One of the most best algae classified under green algae is chlorella. Also one of the blue green algae classified by the biologist was the spirulina. Some of the spirulina and chlorella supplements contains good amount of vitamin c and k and beta carotene also contain plant sterols, omega-3 fatty acid (for anti-inflammatory properties) [1, 2].
To improve the blood cholesterol level and because of the antioxidant property the chlorella and spirulina are promoted. Acoording to the Nutritional journal in 2014 on the basis of small clinal trail for the cholesterol was done over the people suffering from mildly elevated chollestrol took chlorella tablet after every meal for about four weeks had shown reduction in the total cholesterol and triglycerides compared with the people taking placebo [2].

Spirulina
It is a blue-green algae. It is a non-toxic species of bacteria often used as a vegan source of protein and vitamin B12. It can improve the lipid and glucose metabolism also reduces the liver fat and protecting the heart. The main ingredient present in the spirulina that makes about 1% is phycocyanobilin. This compound mimics the bilirubin compound present in the body inhibiting nicotinamide adenine dinucleotide phosphate (NADPH) oxidase. By inhibiting NADPH oxidase it provides potent anti-oxidant and anti-inflammatory effects [7].
Several health benefits [8]:
- Anti-cancer properties
- Reduces blood pressure
- Anti-oxidant and anti-inflammatory
- Lowers triglycerides
- Improves symptoms of allergic rhitinits
- Effective against anemia
- Improves muscle strength and endurance
- Aid blood sugar control

Chlorella
It is native to the Taiwan and japan, naturally rich in protein, vitamins, minerals and dietary fibres. There are various species or types of chlorella each having different nutritional quality. Supplements are marketed in the form of tablets, powders, or liquid extracts. The most practical benefit of chlorella is it grows quickly but it contains a tough cell wall that makes it

rigid and difficult to digest in its natural form. It undergoes the processing before being sold so that nutrients can be properly absorbed [10].

Along with the nutrient content it also has potential to provide other health benefits [11]:

- Boosting the immune system.
- Protection against dementia.
- Fighting against estrogen-mimickers.
- Nutrition.
- Protein.
- Vitamin B12.
- Iron.

Difference between Spirulina and Chlorella

Parameters	Spirulina	Chlorella
Structure	Multi- celled (no distinctive nucleus)	Single celled (with nucleus)
Color	Blue-green algae	Green algae
Nucleic acid	In some amount	More than spirulina
Digestibility	Can be consumed easily after harvest	Requires number of processing
Chlorophyll content	Medium	Higher
Iron, protein	Higher	Medium
Heavy metals	It cannot bind to heavy metals	Its cell wall have unique property of binding with heavy metals.

King of Superfoods

Chlorella is often called as "king of superfoods" it quadruples its number in every 20-24 hours. While consuming the chlorella it supplies in large amount the chlorella growth factor that provides raw nucleotide and peptides that helps the cell to protect, regenerate DNA and RNA. Normally the body manufactures this by their own but when supplied by CGF body utilises it and frees up extra energy to the cells for other biological processes required to amplify the health [5].

Ageing is due to the free radicle and oxidative stress damage, chlorella exerts its protective effect against them and reduces ageing but in elders the already damaged cells are present so it exhibits bioremedial effect (works to repair damaged part of cellular DNA from inside out).

Chlorella is to extremely rich in some of the most hard-to-gel nutrients, like vitamin B12, zinc, essential for supporting neurotransmitter level and proper functioning of brain, the nervous system, immune system and other body processes [6].

It is the major detoxifier of heavy metals, chemicals and raditions by binding to the toxins.

Chlorella is also rich in prebiotic fiber this fiber is indigestible and allows food and fuel for the good probiotic bacteria in your gut, causing them to multiply rapidly and exponentially [4].

Chlorella Growth Factor

Chlorella is grown in fresh water and the whole plant is used to make nutritional supplement and medicine. It is processed and made into tablets and liquid extracts and these extracts contain "chlorella growth factor" described as water soluble extract of chlorella containing chemicals including amino acids, peptides, vitamins, sugar and nucleic acid [3].

It has been found that dried preparation of it may contain from7- 88% protein, 6-38% carbohydrate, 7-75%fat. It is a good source of proteins, fats, carbohydrates, chlorophyll, vitamins, minerals. Possibly it is effective for iron deficiency during pregnancy, taking chlorella might reduce the risk of anemia caused by too little iron in the body in the preganant women [9].

Side Effects and Saftey

Common side effects include:

- Diarrhea
- Nausea
- Flatulence
- Green discolouration of stool
- Stomach cramping
- It also makes skin more sensitive against sun.

Precautions during

- Iodine sensitivity.
- Immunodeficiency.
- Allergy to molds.

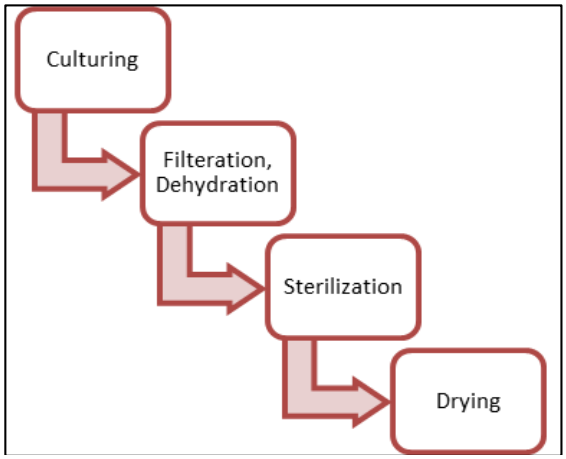

Fig 1: Production of Chlorella

Culturing

The seed stock (chlorella) is transferred to slant medium light and optimum temperature conditions are given simultaneously(Slanted culture).Chlorella from the slant culture is transferred to flat flask containing liquid, light and air with the amount of carbon-dioxide is supplied simultaneously and these are allowed to grow through simple process of photosynthesis. When the concentration of growth is increased it is transferred to the larger flasks (Flask culture). Indoor grown are transferred to the outdoor and the growth is continued in a concrete pool agitation through stirrers is done continuously) (Seed culture). Now it is being transferred to 36-46m diameter concrete pool with constant stirring in-order to let sunlight hitting the whole batch evenly. Water used is the groundwater which is clean and free from contamination, low in hardness. Cultivation under the natural environment makes chlorella rich in vitamin B12(Main culture).

Filtration, Dehydration

Culturing is over after reaching the desired concentration. Filtration is done to remove the appearing contaminants and is dehydrated repeatedly in a centrifuge and is washed, then filtered again and is concentrated.

Cell Wall Pulverization

The digestibility of chlorella is not so good due to its tough cell wall. It is been resolved by pulverization method. A machine called Dyno Mill can be used to physically crush the tough cell wall.

Sterilization

Chlorella contains an enzyme Chlorophyllase, to deactivate this enzyme and for sterilization steam is mixed with chlorella slurry and a high temperature is maintained for short time.

Conclusion

On earth's sea and freshwater there are about 23000 species of algae available. Chlorella is known as the micro algae and is having many biological perks for optimum health and well being. It is full of bioactive substances. It increases the resistance level and also prevents the premature ageing, reduces body fat percentage and contains further more health benefit. It is an important whole grain food supplement that should be included as a key component in a healthy diet.

References

1. Koen Goiris, Koenraad Muylaert, Luc De-Cooman. Microalgae as anovel source of antioxidant for nutritional application, Available online 8th May 2015, sciencedirect.com/topics/agricultural-and-biological-sciences/chlorella, viewed on 3rdfeburary 2019.
2. Koen Goiris, Koenraad Muylaert, Luc De-Cooman. Chlorella: an overview, Available online 8th may 2017, sciencedirect.com/science/article/pii/B9780128007761000169, viewed on 3rdfeburary 2019.
3. Katie Wells. Chlorella benefits and uses, Available online 9thjuly 2015, Updated on 21stjuly 2019, wellnessmama.com/2719/chlorella-uses-benefits/viewed on 7thjanuarary 2019.
4. Dan Wesseles. Chlorella: nutrition facts and possible health benefits, Last reviewed on 18th November 2017, medicalnewstoday.com/articles/320067.php, viewed on 7thjanuarary 2019.
5. Helene Marfaing. Review of taxonomical revision of chloeralla and consequences, Available online October 2014, researchgate.net/publication/271765738_Review_of_the_taxonomic_revision_of_Chlorella_and_consequences_for_its_food_uses_in_Europe, viewed on 7thjanuarary 2019.
6. Barone Jeanine. Chlorella benefits and uses, Published on 1st June 2017, berkeleywellness.com/supplements/other-supplements/article/why-consume-micro algae/viewed on 3rdfeburary 2019.
7. Kamal Patel. Chlorella scientific review on usage, side effects, updated on 29th April 2019, examine.com/supplements/spirulina/, viewed on 7thjanuarary 2019.
8. Jennings Ann-Kerri. Impressive health benefits of chlorella, Revised on 8thapril 2017, healthline.com/nutrition/10-proven-benefits-of-spirulina#section10, viewed on 3rdfeburary 2019
9. Cheng FC, Lin A, Feng JJ, Mizoguchi T, Takekoshi H, Kubota H, *et al*. Effects of chlorella on activities of protein tyrosine phosphatases, matrix metalloproteinases, caspases, cytokine release, B and T cell proliferations, and phorbol ester receptor binding. J. Med. Food. 2004; 7(2):146-152. Chlorella as a vitamin, webmd.com/vitamins/ai/ingredientmono-907/chlorella, viewed on 2nd march 2019.
10. Fareman Justin. The incredible Benefits of chlorella, consciouslifestylemag.com/chlorella-benefits-health-superfood/, viewed on 2nd march 2019.
11. Marc Jaoude. Chlorella: markito nutrition, markitonutrition.com/chlorella-benefits/, viewed on 2nd March 2019.