Spirulina production: answers to some frequently asked questions

1. Does "organic" spirulina exist?

Depends what one calls "organic". The norms and the labels vary considerably from country to country. For example spirulina declared "organic" in the USA would never get the European label!
If one wants the definition "spirulina produced without synthetic fertiliser, without pesticides or food additives" then it is perfectly possible to produce "organic" spirulina, using only natural mineral salts such as nitrates from Chile (natural deposits), natural phosphates, etc. This approach however has two disadvantages:
Even though the nitrates from Chile are perfectly natural they are no longer approved for the "organic" agriculture. Now the only sources of authorised nitrogen are organic nitrogen (urine, liquid manure, animal and vegetable waste). The introduction of these substances to the basin is very difficult due to the hygiene of the culture (problems of mud, of filtering the medium, etc.) and it would probably oblige pasteurising the production (or to work it in a 'discontinuous' way so that the natural pH rise nearly makes the medium sterile). Natural and rough minerals (such as certain phosphates) can contain large contents of heavy metals (they too are completely natural) such as lead and especially uranium.
The question of the "organic" spirulina hence remains open. What is certain is that the spirulina culture is nearly a closed system. In which case one can legitimately doubt the rational behind certain prohibitions from the "organic" labels. The nitrate from Chile, for example, even though natural is forbidden due to the soluble nitrogen, for it is suspected that it will infiltrate into the ground and pollute its phreatiques layers. A spirulina culture however is never directly in contact with the ground, hence this restriction is unnecessary. Even the purges can be completely recycled or even abolished (see Question 2).

2. How to avoid polluting the environment when purging ?

If one opts for a type of culture, which needs purges, it would be advisable to observe the following points:
Purges can neither be thrown into sewages nor into rivers.

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Small quantities can be spilled out on the dry ground, providing that they have been diluted with water at least four times their volume (1:4).
In dry regions it is preferable to let the purges evaporate by creating various shallow lagoons: the recuperated mineral salts can be reintegrated into the spirulina culture.
Further it is possible to recycle the purges in deep basins (> 1m) preferably aired with the help of small compressor. After a few weeks the liquid becomes clearer and the pH stabilises around 9.8, this is when one can reintegrate in the spirulina culture.

3. How to go ahead without a pH-meter?

In most cases the use of a simple pH paper is absolutely sufficient, even excessive in the following situations:
when using a culture medium that is very rich in bicarbonates (Zarrouk type, 0.2M bicarbonate);
when the culture is very shaded so that the productivity is reduced to 5g/j.m²;
or when culture that is regularly purged.
Yet a pH-meter remains very useful when:
the culture medium is very poor in bicarbonate (0.05M bicarbonate);
when carbon in added in the form of sugar;
or when the culture is very productivity intensive.

4. What is the ideal level of a basin culture?

The answer depends on a multitude of factors.
The first thing to check is the evenness of the floor of the basin. If level is completely even the culture can sink up to 5cm.
A low level allows large temperature variations in the culture, which can be dangerous (remember: more than 40°C is generally lethal to spirulina). Productivity difference between high and low ponds levels is small. The spirulina breathing is easier at low level of culture medium: this permits to work with a higher concentration of spirulina, which facilitates the harvesting.
In practice, one keeps a medium level of 20cm, which gives the culture a thermal inert and a comfortable pH inert. A level of 10cm is generally preferable but the culture is more sensitive and needs more attention.
If the basin cannot be shaded, a higher level will avoid over heating.

5. "Zarrouk" culture medium: is it the best ?

The Zarrouk medium has nothing magical about it but it is true that it works well. It is also true that one can ameliorate it (for example the trace elements or the costs).
Often one hears about the "half" or "quarter Zarrouk". Basically this means less bicarbonate, for a concentration of 0.2M isn't necessary. It works perfectly with 0.1M by compensating the salt level with more NaCl. But a high concentration of bicarbonate gives a greater pH inert, making it easier to keep the culture free from other bacteria.However if carbon is added through the bicarbonate, then it is better to work with 0.2M for that will reduce the volume of the purges without adding to the costs.

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6. Is it possible to produce spirulina in cold climates?

Yes, of course.
Spirulina can be produced anywhere and at any time of the year the condition being that the culture has the right temperature and light, which is easy to achieve in a laboratory or a phytotron (greenhouses that reproduce any climate artificially). But in practice this is out of reach for a small producer except if one is happy with an aquarium, which produces a few grams per day inside a heated room.
If the climate is unfavourable such as winter in Normandy, and one wants to produce spirulina commercially, one would ruin oneself financially on the heating and light costs, as is the case with growing tomatoes and cucumbers in that region.
From May to October it is possible to grow spirulina in a greenhouse without heating as long as there is sunlight at least half the time. Then one can achieve the same levels of productivity as in Africa by adding carbon (CO2, sugar or bicarbonate). The difference between a temperate and a tropical climate becomes insignificant if one does not add carbon to enhance productivity, because atmospheric CO2 dissolution becomes the limiting factor (and it is not related to sunlight intensity).

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