



Vinasse



THE PROBLEM STATEMENT:

Very simply, effluent from ethanol production is environmentally damaging when disposed untreated and the cost of full industrial treatments are so high that they can render plants economically unviable – some have already been forced to close in Europe.

Environmentally acceptable solutions at large scale have involved a wide range of technologies none of which seem to be completely successful. The exploitation of the constituents of vinasse as fertilizer has worked (usually at a smaller scale) where farmers collect free vinasse and spray it on their fields.

Excessive use can lead to mineralization of soils and unbalanced populations of bacteria and fungi with a resulting negative impact on soil and plant health as well as on groundwater.

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VINASSE USUAL COMPOSITION:

Vinasse analyses

| Parameters | Range |
|-----------------------------------|----------------------|
| pH | 4,8 - 5,4 |
| Conductivity | 24,1 - 28,7 mS/cm |
| DQO | 90.000 - 110.000 ppm |
| DBO | 31.000 - 54.000 ppm |
| Total Solids | 7,6 - 11, 3 % (w/w) |
| Ether-Soluble Substances | < 1 - 12,1 mg/l |
| Settable Solids (in 6 days) | 27 - 74 ml/l |
| Ash | 3,3 - 4,8 % |
| Organic Matter | 5,5 - 8,9 % |
| Organic Matter / Inorganic Matter | 1,6 - 1,9 |
| Calcium | 0,16 - 0,25 % |
| Magnesium | 532 - 880 ppm |
| Sodium | 544 - 1800 ppm |
| Potassium | 1,21 - 1,82 % |

The table below shows all the by-products associated with the production of ethanol from sugar cane.

| VINASSE | ASHES | FILTER CAKE | MEDULA | VINASSE | FILTER CAKE | ASHES |
|----------------|--------|-------------|--------|---------|-------------|-------|
| PH | 9,44 | 5,17 | 5,84 | 4,55 | 7,6 | 8,92 |
| CONDUCTIVITY | 1,55 | 3,14 | 0,43 | 25,1 | 1,3 | 0,92 |
| ORGANIC CARBON | 16,4 | 39,11 | 49,9 | 40,12 | 35,12 | 5,02 |
| ORGANIC MATTER | 30,13 | 70,4 | 89,98 | 69,04 | 63,62 | 9,03 |
| NITROGEN | 0,3 | 1,91 | 0,36 | | 1,97 | 0,16 |
| C/N | 55,8 | 20,48 | 138,86 | | 17,94 | 26,63 |
| PHOSPHORUS | 0,28 | 1,09 | 0,39 | 0,2 | 1,2 | 0,2 |
| POTASSIUM | 1,1 | 0,9 | 1,7 | 10,48 | 0,42 | 0,77 |
| SODIUM | 0,23 | 0,09 | 0,04 | 0,41 | 0,09 | 0,16 |
| HUMIDITY | 65,03 | 73,81 | 42,58 | 88,55 | 77,67 | 60,35 |
| | 113,47 | 187,31 | 184,95 | 208,8 | 180,09 | 75,69 |



BIOLOGICAL CONVERSION OF VINASSE INTO FERTILIZER USING ERGOFITO

INTRODUCTION:

Vinasse, for its chemical and organoleptic characteristics becomes an excellent agricultural fertilizer when biologically treated.

The fusion of Vinasse with **Ergofito Micro Concentrate** provokes, bacterial, enzyme and fungi activity which are integral to **Ergofito Micro Concentrate**, thus transforming organic substances into humic substances. Increasing mineral and nutrition assimilation, regenerating soil and reducing soil fatigue.

With this approach we avoid plant nutritional stresses as the organic substance plus the microorganisms activity, make the mineral nutrients available to the plant at its request. Furthermore those microorganisms fix 100 Kg of Nitrogen per hectare, extracting same from the atmosphere which leads to a financial and logistical saving.

QUANTUM:

The amount of Vinasse per hectare must be proportional to the various required soil nutrients, minerals, elements etc. Taking into consideration that for sugarcane the main element is Potassium (K), by applying 50 tons of Vinasse per hectare per season, we enrich the soil with the following:

| | |
|----------------------------------|---|
| K ₂ O Potassium oxide | 180kg |
| N Nitrogen | 23kg (Organic N is equivalent to 69Kg of N from nitrates) |
| P 2O ₅ Phosphorus | 12kg |
| CaO Calcium oxide | 59kg |
| Mg Magnesium | 26kg |
| Fresh organic matter | 1630kg |

The above requires 2.5Kg of **Ergofito Micro Concentrate** per hectare.

Please note that when any fertilizer is applied, the soil analysis must be taken into consideration and advised by a competent person to ensure that lack of nutrients, trace elements etc. are added or to avoid excesses.

The above table is based on Vinasse analysis done by an agricultural institute in Argentina.

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APPLICATION:

Treating Vinasse with **Ergofito Micro Concentrate** transforms the said Vinasse into a biological fertilizer which can be applied to any crop or plant type. The use of Vinasse without biological micro-organisms may damage the vegetation. This is due to the organic substance which in absence of micro-organisms needed to transform the carbon present in the humus, allow the spontaneous bacteria to oxidize the said carbon by removing the oxygen required by the root system, thus temporarily creating asphyxiation.

The bacteria present in **Ergofito Micro Concentrate** will multiply by extracting its nutrition from the organic substance in the Vinasse. By utilizing the potassium for its own vital use, it will further reduce the amount of Potassium reaching the plant.

If the soil is found to be high in conductivity, it is necessary first to know the origin of the conductivity. In any event, **Ergofito Micro Concentrate** will considerably reduce the possible impact.

It is important to have soil analysis for each case prior applying any fertilizer including Vinasse. Once what is missing or in excess is evaluated, the correct formulation can be prescribed. The Vinasse analysis is well known and is consistent.

Mixing per hectare per year:

Vinasse 50 Tons

Ergofito Micro Concentrate 2.5Kg

NB. All other missing nutrients, elements etc. must be added accordingly.

In the event that the Vinasse amount applied is reduced, maintain 2.5Kg of **Ergofito Micro Concentrate** per hectare.

SUM UP:

| | |
|---------------------------------|-------------------------|
| 1 ton of sugarcane produces | 85 litres of Ethanol |
| 1 litre of Ethanol produces | 12 litres of Vinasse |
| 1 hectare of sugarcane produces | 65 tons of Sugarcane |
| 1 hectare of sugarcane produces | 5525 litres of Ethanol |
| 1 hectare of sugarcane produces | 66,3 tons of Vinasse |
| For an annual production of | 900 000 tons of Vinasse |
| The total sugarcane required is | 13 600 hectares |
| Vinasse surplus will be | 220 000 tons |

The surplus vinasse can be used once transformed into fertilizer, on any adjacent crops. The most logical and ecological manner of eliminating the Vinasse problem is related to its usage for

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producing the next sugarcane crop from the fields that feed the mill. Many methods have been tried with little or no success, biological conversion and recycling is the most logical way to reduce costs, eliminate the problem and abide to a green natural approach.

TESTING:

Testing the above is simple and fast. We need a control and an equivalent land parcel, whereas control is fertilized in the normal manner, while the test parcel is fertilized with the biologically converted Vinasse plus its missing nutrients.

Soil tests need to be done regularly as to monitor and compare the progress. Paying special attention to conductivity, Potassium levels and the fresh organic matter resulting from the biological action of **Ergofito Micro Concentrate**. Both land parcels should be planted with sugarcane.

COMPOSTING:

Beside Vinasse, the mill produces three other wastes, namely:

- Ashes
- Filter cake
- The centre of bagasse (medulla)

All of the above three wastes are organic and good to compost. The **Ergofito** full composting protocol should be used in conjunction with Vinasse to further produce a high quality non-liquid fertilizer that can supplement or replace further conventional fertilizer.

CONCLUSION:

Ethanol production is rising worldwide, Vinasse is considered by some a fertilizer and by some an effluent waste. Around the world, Vinasse disposal by means of dehydration, gasification, fertilization and many other methods have only been marginally successful.

In essence biological conversion solves both the ecological and the fertilization problems. If the mill would supply the ready Vinasse to its suppliers even logistical problems are abated.

It would be possible to consider that when the trucks delivering sugarcane to the mill, could have a 20 tons inflatable bowser that can be filled after delivering the sugarcane, thus avoiding logistical costs.