CUSTOMER:

RECIPIENT:

IN SUBSTITUTION: N/A

SUMMARY/CHANGE CONTROL: N/A

KEY WORDS: Process description/ Sea salt marsh/ Bioproduct

RELATED DOCUMENTS: N/A

COPIES: Innoget/ BCZ

	DATE	NAME/ SIGNATURE
Issued		
Reviewed		
Approved		

T A B L E O F C O N T E N T S

Page

1. INTRODUCTION

Natural sea salt production in salt marshes is a process where sea water circulates from basin to basin. Due to the influence of sun action and wind, water evaporates and salt concentrates into to the crystallization basin from which it is recovered (Figure 1)

Fig. 1. Salt production in salt marshes

Some microorganisms, called *Halophiles*, have developed adaptation strategies that enable them to live in environments where salt concentration can attain even five times the sea salt concentration. Such microorganisms can be found in sea salt marshes and also salt lakes.

There seems to be little in common between a human being and a microorganism that lives in salt marshes, but they have a similar challenge: fighting against dryness. To compensate the deleterious effects of the extreme conditions halophile secretes exopolysaccharides and glycoproteins building a protective shield surrounding them.

This constitutes an interesting characteristic to consider these compounds as potential cosmetic ingredients for skin care or other high-value purposes within the pharma or agrofood fields.

2. BIOCHEMIZE'S PROCESS TO OBTAIN HIGH-VALUE NATURAL BIOPRODUCTS FROM SALT MARSHES

Biochemize S.L. has developed a new green process designed to recover the compounds present on the environment where halophilic microorganisms live. Among the different compounds recovered, it is worth mentioning a concentrated extract with a high content in glycoproteins.

According to several preliminary tests conducted by Biochemize S.L., this product has shown potential cosmetic applications that could be used as a moisturizing, UV-protection, antioxidant and chelating agent.

3. SCIENTIFIC BACKGROUND

Sea salt marshes can be found all over warm coast regions in the world. Sea salt production process is an ancient technology where seawater circulates through different basins and it is drawn out by natural evaporation up to salt settles into crystallization ponds (Figure 2)

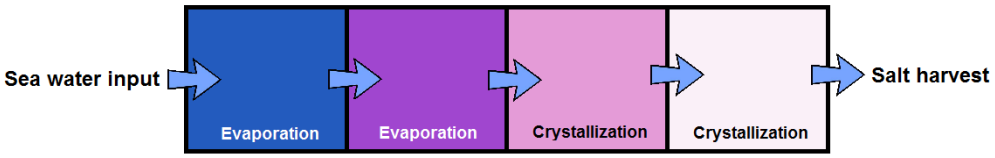

Fig 2. Scheme of the process for the production of marine salt,

Some of these basins are suitable to recover active compounds. The presence of microorganisms can be detected by a characteristic pink/red colour, due to the growth of halophilic microorganisms.

A typical sea salt marsh of about 2000ha can supply around 20000 m^3 of raw material.

4. PRODUCTION PROCESS DIAGRAM

The process to produce Biochemize's natural bioproduct from salt marshes has the following steps (Figure 3):

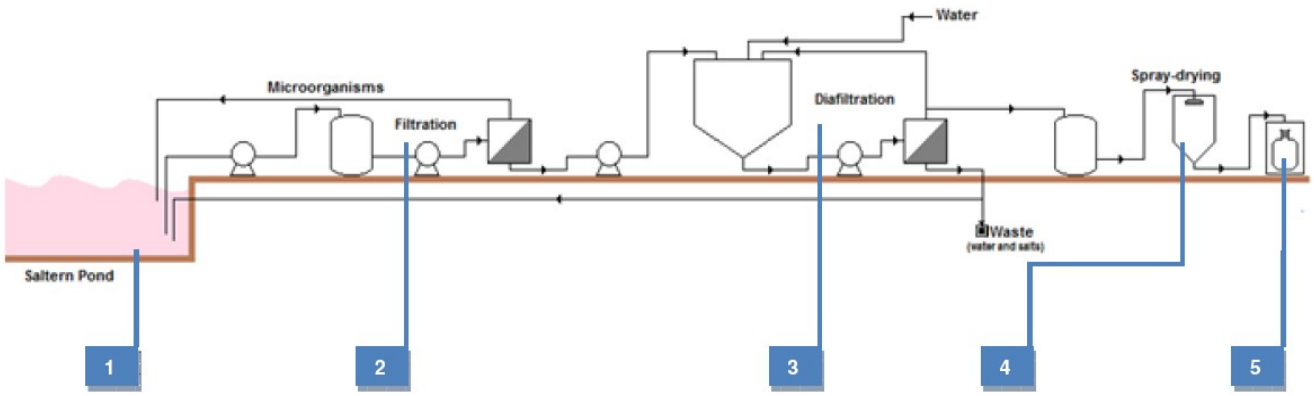

Fig. 3. Process flow diagram for the isolatio n of the extract

The process developed includes several steps:

- **Step 1: Harvesting**

  The raw material suitable to obtain Biochemize's natural bioproduct has to meet some acceptance criteria based on several experimental parameters (pH, conductivity, dry weight, etc). Once the conformity is met, the raw material is pumped to the primary process tank.

- **Step 2: Clarification**

  Microorganisms and suspended solids are removed from the liquid phase by centrifugation or filtration. This step can be achieved using a continuous centrifuge or filtration (normal and/or tangential flow filtration). The pellet or retentate containing microorganisms is returned to the basin thus maintaining the original population of microorganisms.

  Alternatively, a different process and flow diagram may be followed for this pellet if found interesting to exploit it for other potential purposes.

- **Step 3: Concentration and Purification**

  The aim of this step is to concentrate the product and remove salts. This can be done by tangential flow filtration using a 100kDa cut-off membrane.

  The designed filtration process has 2 steps:

  1. Concentration
  2. Dialysis by tangential flow filtration

  The process allows concentrate 100x the solution and reduces the salt content by 99%. Rejected stream (brines) can be returned to the sea salt basins or wasted, as preferred.

- **Step 4: Final Treatment**

  The final step drives to a stable and concentrated product. Spray-drying, freeze drying, oven heating, vacuum evaporation or any other unit operations are suitable to give the final product the appearance and characteristics desired.

- **Step 5: Packaging**

  The product can be packaged according to desired requirements.

Note: No chemicals are added or used during the whole process, which is entirely environmental friendly

An important point to remark is that this process has been developed for the production of the microbial extract, as it has been described.

It is clear that each one of the different microbial strain species (alone and/or in consortium with other species) present in this type of water has developed its own strategies for the synthesis of different secondary metabolites, with specific metabolic functions each.

There is significant literature about it, and some of the molecules produced and its functions are reasonably well known (i. e. surfactins, UV-radiation absorbers, carotenes, etc.). From the microbial extracts obtained and/or directly through fermentative procedures where single or consorted microbial cells are grown up; a wide portfolio of products of natural origin can be obtained.

In this case and for each one of these metabolites of possible interest, an specific fermentation/ accumulation process using living microbial cells should be developed.

From this standing point, the industrialization step can be approached by the usage of a specific fermentation broth, based on the saline water medium; to support the growth and metabolites expresion of the target microbial flora, selected on the basis of the extract fraction which is pursued. On the top of all, the Biochemize's knowledge of the natural environment, where these biofunctional extracts happen, is a potent ally for the design of a controlled production process, and it's a powerful driver for speeding up the overcoming of the industrialization gap.