

Part 4: The Demonstration Project of Large-Scale Desert Greening by the Japan Petroleum Energy Center (PEC) (3)

In this issue we would like to report on some research undertaken for the third theme; development of greening technologies.

1. Greening technology development using symbiotic microbes:

This research project aims to develop technologies of: 1) segregational culture and growth fixation of rhizobium which have the function of fixing nitrogen from the air as a symbion of arid land vegetation, and of vesicular arbuscule (VA) mycorrhiza microbes which help in the absorption of phosphorus, minerals and water; 2) seeding of crops inoculating with such bacteria / microbes; and then 3) nurturing of healthy seedlings which have formed root nodules or mycorrhiza. At the same time it aims to establish a water-saving technology of partial water culture, which supplies nutrient water only to a certain part of the root. This water-saving farming technique may be used in combination with the above seedlings nurtured with microbes, depending on the environment and the potential of the particular locality. The project tries to work out site-specific cultivation methods taking into consideration the local environment.

2. Greening with the help of growth promotor:

It has been confirmed by pot experiments in Japan that by treating the root or some other parts of a plant body with low-concentration 5 Aminolevulinic Acid (5-ALA), the salt-resistance of some plant species can be increased, while the growth of roots can also be accelerated. Also, since this 5-ALA is a product of natural fermentation by microbes, it is more eco-friendly than chemically synthesised substances. It is expected that by introducing 5-ALA into the agricultural practices of Saudi Arabia, the greening process can also speed up, and greening and cultivation practices can be improved in the areas suffering from serious salt problems. Under this research project, 5-ALA is being applied to model plants such as cotton and other plants used for greening. During this pilot cultivation, the photosynthetic activity and nutrients of the target plants are observed and analyzed in order to collect sufficient data to work out the best concentration of 5-ALA when applied to various species.

3. Determination and assessment of a mixing ratio of various soils and organic matters for greening:

Most of the soil in arid or semi-arid land is sandy and exists in severe conditions with little water-holding capacity, few organic substances, and high rates of evaporation and salt accumulation. In order to overcome such difficult conditions, this research project aims to develop the soil mixture ratio most appropriate for the primary cultivation of plant species for the greening activity. For example by mixing sandy soil with organic matter available in the locality (such as date palm leaves, sewage, sludge, and the excreta of humans and livestock).

4. Screening of salt and drought resistant plants:

Irrigation in arid land has always been faced with various problems related to salt accumulation in the soil and the quality of irrigation water. In Saudi Arabia there is no water source, which could supply a sufficient amount of fresh water, and over 90% of water used by humans comes from groundwater containing salts. Some plant cultivation in this country is also compelled to use such salty water in order to conserve fresh water resources. Under this research project, experiments are conducted on the levels of salt-resistance of different forage plants. It is also studying the impact of salt water irrigation on plant growth and soil. It also aims to evaluate the biomass of forage plants cultivated by salty water irrigation, to assess the drought resistance of desert plants, and to examine the economic viability of the greening plants from a viewpoint of salt and drought resistance.

5. Greening and nurturing of flowerbed seedlings technology by using the automatic seeding & germination machine:

In Saudi Arabia you often encounter many flowerbeds, trees and other types of vegetation in parks, along streets and around buildings. Seedlings needed for these are produced in many parts of the country. In Japan, as well as in Europe and North America, a common process of producing such seedlings is to make plug seedlings or cell seedlings first, from which polypot seedlings are subsequently cultivated. The objectives of this research are: 1) to select cultivation soil made of materials available in Saudi Arabia; 2) to establish the production technology of plug seedlings and polypot seedlings using the plug system and automatic seeding & germination machine; and 3) to examine the possibility of distributing the plants in water-saving planters (made of a container holding the plant and soil with a piece of cloth at the bottom inside another container holding water) in many parts of the city.



Use of symbiotic microbes in the outdoor pilot farm



Outdoor pilot farm.

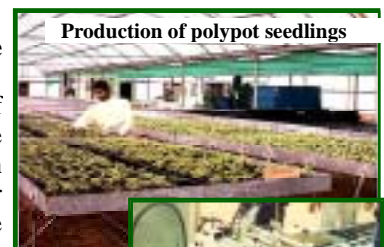
Use of growth promotor in the greenhouse pilot farm



Site for comparative study of organic materials



Examination facility for screening of salt and drought resistance



Production of polypot seedlings



Automatic seeding and germination machine