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Biofuel promising plants and micropropagation

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Introduction

The world is now heading for using oil alternatives in all areas of industry where the oil doomed to vanish. Biofuels in compared with fossil fuels, release fewer pollutants and greenhouse gases, such as carbon dioxide, into the atmosphere. Biofuels are sustainable and consists of two main categories: bioalcohol and biodiesel. Ethanol, which could be made from corn, wheat, sugarcane, etc., releases less carbon monoxide, nitrogen oxide and sulfur into the atmosphere than gasoline. Biodiesel is made from animal fats or vegetable oils and renewable resources that come from plants such as jojoba, jatropha, soybean, sunflowers, corn, olive, peanut, palm, coconut, safflower, canola, sesame, cottonseed, etc.[1] The availability and sustainability of biodiesel resources will be the limiting factor in the widespread use of biodiesel.[2] Biofuels could be applied, without competing food supply and planted areas, using non-edible plants which tolerate drought, salinity and high temperature and can be planted in areas unsuitable for planting food crops. Furthermore, waste and saline water can be used in irrigating these biofuel plants with limited need of drinking water consumption.

Jatropha and Jojoba are unique for biofuel production and they can tolerate the previous conditions. Jatropha is native to South America and widely distributed in South and Central America[3] while, jojoba is native to Sonoron desert and North-west Mexico and Baja California.[4] Jatropha seed contains 40-60% (w/w) of non-edible oil. The oil contains 21% saturated fatty acid and 79% unsaturated fatty acid.[5] It does not congeal at cool temperature and has some unique properties that make it suitable as a biodiesel.[6] These properties are low acidity, good oxidation stability and low viscosity as compared to some other plant oils.[7] Similarly, jojoba oil has most of the previous unique properties.[8] Its oil has (97 %) of linear long- chain esters, which are characteristic components of waxes.[9] More than 80 % of these are esters of C18-, C20-, C22-, and C24- chain monounsaturated alcohols and fatty acids.[9,10] Jojoba oil is an unusually pure compound with less than 3 % triglyceride content and highly resistant to oxidation.[8] Unlikely, Jojoba wax has many other applications in cosmetics and personal care formulations.[11]

Jatropha and jojoba can be established sexually from seeds or asexually by vegetative propagation. Cultivation of these plants with seeds shows high variation in growth, maturity and yield. Moreover, jojoba is a dioccious plant and its propagation with seed lead to give 1:1 sex ratio in the field.[12] Thus, vegetative propagation is an important target for applying a large number of these plants with similarity and homogeny in growth and yield. Tissue culture application could be unique for clonally production of these plants.

Shoot proliferation

Jatropha and Jojoba attracted a huge interest in tissue culture, earlier in 1970's and 1980's. Srivastava[13] and Srivastava et al.,[14] induced triploid roots and shoots from mature endosperm of Jatropha panduraefolia. Birnbaum[15] developed a micropropagation method for jojoba using accelerated axillary bud. Coutino et al.,[16] stated that, jojoba stem node explants cultured with two lateral buds in a Murashige and Skoog medium (SM) containing cytokinins gave rise to new shoots bearing 15 nodes in all. Jauhar[17] determined the best culture conditions and media for shoot and root formation from jojoba nodal and shoot segments. Recently, jatropha proliferation was achieved from petioles[18,19] from leaf disc[20] and from axillary nodes.[21] Fayek et al.,[22] induced shoot multiplication of jojoba distinguished clone from shoot tip and nodal segments. Multiplication could be highly achieved by cytokinin but callus induction was applied using auxin alone or combined with cytokinin. In addition, presenting in vitro jojoba shoots to seawater levels increased shoots multiplication and callus cultures significantly.[23,24] Laser irradiation was also investigated on jojoba in vitro culture.[25]

Rooting

Rooting and acclimatization of jojoba in vitro plantlets seemed to be difficult due to the low percentage of rooting obtained.[22] However some advantages were detected.[26–29] Although Singh and Shetty[30] indicated that jatropha is difficult to root, Daud et al.,[31] achieved 46% rooting. Moreover, Panghal et al.,[32] assured that jatropha shoots was highly rooted. The rooted plantlets were cultured in soil with more than 90% survival. That seemed to be dependent on easy to root clones or strains, age of started explants, type of auxins used in rooting media, etc.

Oil

Jojoba oil was not only obtained from seeds but also from various explants. In vitro callus cultures could be a source for jojoba oil.[24,33,34] Similarly, Demissie et al.,[35] determined fatty acids from somatic embryos of jatropha. However, it needs more research to enlarge oil amount for both plant in vitro. There is no doubt that in vitro culture of these promising plants needs more researches to determine a protocol for their micro propagation.

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Conflict of interest

The author declares no conflict of interest.

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