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JOJOBA - TACKLING MULTI ENVIRONMENTAL STRESSES IN ONE DAY: A REVIEW

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ABSTRACT

Under arid conditions and the scarcity of water resources, it is desired and demanded to have stress-resistant plants especially environmental stresses in large areas around the world that are suffering from desertification. World agricultural production is in need to sustainability to cover the growing demand for food. Thus, the plant properties that mean high tolerance to more than one environmental stress especially heat, salt and drought is a treasure that must be exploited. The change in the jojoba properties by using few milligrams of plant growth regulators makes the jojoba an invaluable treasure that must be exploited. The rare types of liquid wax in their seeds maximize its industrial and agricultural values. The additional benefits gains by a safe compound such as Proline double its potential to tackle many stressful conditions in the field. Thus, no wonder to see jojoba vegetation covering fast areas of the world desert. The jojoba plant is really deserving to be called the gold of the desert since it is one of the rare plants that can tackle the multiple environmental stresses by highly tolerant vegetation that have a stabilizing nature with low nutrient requirements and a deep root system giving a valuable industrial as set even under harsh conditions.

Keywords: Jojoba, Plant growth regulators, Proline, Abiotic stresses.

INTRODUCTION

Common name: Jojoba

Latin name: Simmondsia Chinensis

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Family: Simmondsiaceae

Botanic description:

It is a leafy, xerophytic, or shrubs, multi-stemmed tree with oppositely arranged leaves, oval or lanceolate, green or blush-green, lathery leaves that reach heights of 0.5 to 1 metres.

This plant can survive in mild temperate desert environments with little to no cold and is somewhat resistant to salt stress. The plant can withstand heat stress in the range of 0 to 47 ^{o}C. Although adult plants can withstand heat stress down to 10 degrees, seedlings are vulnerable to light chilling at temperatures just below freezing. Heat stress is particularly well tolerated by jojoba plants.

Today, desertification is seen as a serious danger to the world's biodiversity and a pressing environmental concern. Several other reasons, including deforestation, excessive grazing, unsustainable farming methods, and excessive use of soil. The jojoba plant, which has lucrative industrial applications and grows readily on desert terrain, is one of several economically significant plants that can adapt to desert agriculture. This is why many people refer to jojoba plants as the "gold of the desert."

Jojoba Plants are employed for revegetation in desert environments because they can withstand the typically harsh climatic conditions. Due to its low environmental requirements, strong root structure, resistance to drought stress, longevity, and low vulnerability to fire, jojoba plants have the potential to be a soil stabilizing species. As jojoba oil's qualities have been compared to those of sperm whale oil, it is a potential important industrial plant species for the management of desert fractions. As a result, the amount of jojoba oil produced has been greatly reduced. The sperm whale's prey, an aquatic species in risk of extinction. The amount of oil produced by one hectare of jojoba cultivation is equivalent to 124 sperm whales. Additionally, the intercropping of jojoba crops on arid soil contributed to their eco-friendliness and slowed the progress of desertification.

Additionally, jojoba flower buds were said to grow at the second and third nodal positions on the stem. Nodal buds therefore differentiate and grow into flowers.

In the plant realm, the jojoba plant produces oil that is chemically a liquid wax and is unmatched. A synthetic ester of long-chain fatty acids and alcohols makes up the liquid wax. Because it leaves no glycerin residue and is easily altered by hydrolysis, hydrogenation, halogenation, and sulfurization, phosphosulfurization and ozonozation techniques liquid wax is unmatched in nature.

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Potential of jojoba improvement by sale compounds

Plant growth regulators have been used in several attempts to increase the quantity and quality of jojoba plants over the years. Three clone-specific young plants' branching has been improved by applying benzyladenine (BA) to their leaves. The fruiting characteristics of the jojoba clone, including fruit set, seed yield, seed weight, and seed wax content, as well as several vegetative qualities (tree height, tree canopy volume, branching and node attributes), were variable (Bakeer 2019).

Beginning on May 1st of both seasons (2015 and 2016), BA had four treatments each year spaced one month apart. A greater BA concentration (150 mgl-1) was shown to generally increase the number of branches. The increase in branch formation was connected with an increase in floral bud output and seed yield. The clone s-700 responded most favourably to BA treatments to the leaves. This study also demonstrated that BA is effective in releasing lateral branches from jojoba plants that are under two years old. Their findings corroborated those of earlier research ((Dal Cin *et al.*, 2007; Elfving and Cline, 1993). which found that BA enhanced vegetative growth. Additionally, it was shown that applying three quantities of 6-BA, gibberellic acid (GA) and (GA_{4+7}), and promalin (a combination of BA and GA_{4+7}) had a positive effect on the branching and flower output of three jojoba clones, whether in a greenhouse or outside. When treating plants in August, The generation of flower buds and branching were both significantly impacted by the growth regulators, and different clones responded differently. In comparison to the untreated control jojoba plants (Ravetta and Palzkill, 1992), the most successful treatments for the highest responsive clone were 100ppm GA_{4+7} and 100ppm promalin, which led to a 133% and 110% increase in flower buds after 17 months, respectively. In another study, the type of seed lipids content was affected by the GA_3 treatment especially at 150 ppm. The jojoba oil contained C 20: 1 oil major constituent followed by C 18:1, C 22 : 1 and C 24: 1 respectively whereas C 14:1 was present at low concentration. Moreover, the treatment of 150 ppm GA_3 gave the minimum 50% flowering (41.24 and 37.50 days and recorded the highest means of branch length (95.09 and 98.68) and secondary branch as length (50.29 and 52.84) in both seasons (Al-Taweel *et al*., 2018).

Further study on jojoba growth as influenced by the applications of zinc sulphate (0,25,50,75 ppm) plus GA_3 (0,50,100 and 150 ppm) thrice in the beginning of December, march, may. The results revealed that all combination treatments showed a significant improvement in all examined parameters with an increase in ZnSo4, GA_3 levels in comparison with untreated trees (atteya *et al*., 2018). Even with the chemical constituents and the yield, the results revealed that all treatments enhanced vegetative growth characteristics along with flowering characteristics (flowering date, flowering percentage, fruit set, seed yield, oil content of seeds and their

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consistent and chemical composition of leaves (chlorophyll A,B and total chlorophyll content) in addition to the N,P and K % as compared with control in both seasons (atteya *et al*., 2018). Further evidence was obtained for the rate of GA_3, BA or/and GA_3+BA (Khattab *et al*., 2019). In another study, the combination of GA_3 50 ppm and camphor oil (1.5 or 3 cm^3/l) gave the best results during the two studied seasons. Therefore, for improving yield and seed quality it could be recommended spray jojoba with a mixture of GA_3 plus camphor oil at 1.5 or 3 cm^3/l under the studied conditions (Mostafa *et al*., 2017). Foliar application of the cytokinin BA at 150 mg/l and GA_{4+7} at 150 ppm on growth and flower developmentof 5 years old plants of two jojoba clones was also studied, the application was done on October 5, 1999 in spring. Plants were evaluated 120, 240, and 360 days. The total number of flowers on two sprayed clones was significantly increased by the BA treatment and significantly reduced by GA_3 treatment. The seed yields evaluated 180 days after application were not statistically different from the control due to an increase in flower abortion (Part *et al*., 2008).

Potential role of Proline to enhance jojoba cultivation

Even in highly tolerant plants to heat stress, the application of proline enhanced most of anatomical characteristics of jojoba leaves under saline conditions. In conclusion, proline as a foliar application at 450 ppm under salinity stress of 10000 ppm enhanced jojoba tolerance to salinity stress by modifying the physiochemical and morphological characteristics of jojoba plants (Aboryia *et al*., 2022). The effect of proline included the plant height increase, shoot number increase and stem diameter increase as well as number of leaves, leaf thickness, leaf area, leaf fresh and dry weight and some chemical characteristics namely total phenolic content, leaf chlorophyll a and b, carotenoids, leaf mineral contents (N, P, K, Na and Cl) and reduced oxidations and ion leakage, while increased the ant-oxidation activates. In a similar manner, when proline was applied at 10 and 20 mM, the adverse effect of salt stress (5.10 dsm^{-1}) were mitigated and 20 mM proline treatment showed superior effects compared with 10 mM treatment (Alotaibi *et al*., 2019).

CONCLUSION

Jojoba treasure must be demanded by many countries around the world especially by countries that apply arid agriculture since the plants can produce a very valuable seeds giving liquid wax. Such products open many industrial opportunities. The unique about this plant is the sustainability of production as it enhances the tolerance of many abiotic stresses.

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