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Crop And Ethnomedicinal Plants Proteomics In Response To Salt Stress

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Abstract
Medicinal and aromatic plants are cultivated for different plant parts and their active constituents are used in many ways, especially for drugs. Owing to their high curing value and wild occurrence in diverse environments, they have been considered to be promising plants for marginal lands, new reclaimed-soils and semi-arid regions. The high yielding genotypes of these plants are very encouraging, because a substantial number of literatures reports on the response of medicinal and aromatic plants to salinity stress. Little information is available on medicinal and aromatic plants. The general objective of the future studies is better understanding of the response of medicinal and aromatic plants to salinity stress by evaluation of the relative tolerance of different medicinal and aromatic plants and their sensitivity at different plant stages; and how different environmental conditions affect salt-stressed medicinal and aromatic plants; morphological and physiological traits that contribute to salinity tolerance in medicinal and aromatic plants; the ameliorative effects of nutrition and other treatments on growth, mineral uptake, photosynthesis and active constituents of salt-stressed plants; alleviate the mechanisms of salt resistance in medicinal and aromatic plants.

Keywords: Salt Stress, Medicinal plants, Yield, Seed germination, Seedling growth

Introduction

Herbal medicine use has a long history, and medicinal plants are one of the most significant and significant groups of crops that have been utilised for conventional disease prevention and treatment. Proteome analysis is one of the most widely used techniques for examining how plants react to environmental stresses because it is simple to extract proteins, produces two-dimensional electrophoresis gels with high reproducibility, and is also very sensitive at sequencing proteins using mass spectrometry (MS). According to the World Health Organisation (WHO), 80 percent of people worldwide still use herbal remedies. Nearly 19% of adult populations in the United States utilise herbal medicines (Aghaei & Komatsu, 2013). Around 20% of the world's irrigated land is affected by salt stress, a global issue that inhibits agricultural production worldwide. Salt sensitivity affects a number of important crops, including pepper, eggplant, potato, lettuce and cabbage. Important cereals like rice and maize are similarly susceptible to hyperosmotic stressors, and their productivity significantly declines on soils with high levels of salt. Therefore, the need to produce crops that can respond to salt stress is developing as a result of both the increasing salinization of soil and the expanding global population. Deep gene expression changes are required for salt stress tolerance, and these changes also affect the plant transcriptome, metabolome, and proteome (Flowers & Yeo, 1995). Gene expression changes at the transcript level do not always reflect protein-level alterations. This reflects the high importance of plant proteome since proteins are directly involved in plant stress response (Aghaei & Komatsu, 2013). Various environmental stresses that plants are frequently exposed to hinder their growth and productivity as well as significantly reduce global agricultural output. On. Salt stress is one of the most significant variables influencing plant growth and the formation of secondary metabolites (Said-Al Ahl et al., 2011).

In addition to enzymes, proteins include components of transcription and translation machinery therefore they can regulate plant stress response at transcript and protein levels Thus, investigation of plant response to stress conditions at protein level can provide a powerful tool to reveal the physiological mechanisms underlying plant stress tolerance (Ngara et al., 2012; Aghaei & Komatsu, 2013). The production of essential oils and other medical plant components is strongly impacted by salt stress, making research into the processes of salt tolerance in medicinal plants extremely important (Said-Al Ahl & Omer, 2011). The development of medical plants that can withstand salt increases global output of the ingredients used to make medicines, flavours, perfumes, and spices. The proteomic approach is a potent tool to identify the responsible proteins in secondary metabolism in medicinal plants because it is necessary to know which protein or proteins are involved in the biosynthetic pathway in order to increase the production of a special compound in a medicinal plant (Williamson, 2003). One of the proteins that is accumulated during salt adaptation, osmotin, has received the most research. Proline and glycine, the two most significant osmoprotectants, are produced by the osmotin gene. Betaine in response to osmotic stress caused by salt stress, it appears that osmotin similar proteins as well as osmotin can give salt resistance to these crops. It has been suggested that sugar beetroot has salt-responsive proteins, including NADP reductase, aminomethyl transferase, and decarboxylase subunit T, which have been found to increase in response to salt stress (Hajheidari et al., 2005). RuBis CO small subunits, phosphor glycerate kinase, which catalyses a reduction step in the Calvin cycle, and phosphoribulokinase, which catalyses phosphoribuloylation are other proteins that have risen in salt-stressed crops (Verpoorte et al., 2002). In places of the world where plants are grown, salinity of the soil or water is one of the main stressors that prevent production from increasing. This is especially true in arid and semi-arid climates, where it can severely restrict plant growth. Three general categories can be used to group the detrimental effects of salts on plant growth: Water stress in plants is caused by (i) a decrease in the osmotic potential of the soil solution, which decreases plant accessible water, and (ii) a deterioration in the physical structure of the soil (Said-Al Ahl et al., 2011).

Effect of salt stress of plants

Seed germination

One of the most salt-sensitive plant growth phases, germination is significantly impeded by rising salinity. Numerous writers on *Ocimum basilicum*, *Eruca sativa*, and other plants documented this poor response of seed germination under salt stress. *Thymus maroccanus*, chamomile, sweet marjoram, and *Petroselinum hortense*. There are two ways that salinity influences seed germination: (i) there may be enough salt in the method to reduce osmotic potential to a level that will slow down or impede the absorption of water required for the mobilisation of nutrients needed for during germination, (ii) the ions or salt components may be harmful to the developing embryo (Said-Al Ahl & Omer, 2011).

Seedling growth

The most vulnerable stage in a plant's life cycle is when it is a seedling. *Thymus maroccanus* seedling growth was shown to be significantly reduced by salt, according to research. Salinity slows or prevents the mobilisation of reserve nutrients, halts cell division, damages hypocotyls, and causes hypocotyls to enlarge. Basil, chamomile, and marjoram have all been linked to decreased seedling growth (Said-Al Ahl & Omer, 2011).

Morphological characteristics and development

Several investigators have reported plant growth reduction as a result of salinity stress, Foeniculum vulgare subsp. vulgare; *Majorana hortensis*; peppermint, pennyroyal, and apple mint; *Matricaria recutita*; *Thymus maroccanus*; geranium; *Thymus vulgaris*; sweet fennel; sage; *Mentha pulegium*, etc. Under salt stress, there was a noticeable decrease in the number of leaves, leaf area, and leaf biomass on *Mentha piperita, Valeriana officinalis* and *Lipia citriodora* var. verbena (Said-Al Ahl & Omer, 2011).

Yield

Salinity significantly reduces the production of plants. According to what was previously said, the negative effects of high salinity on plants can be seen at the whole-plant level as plant death and/or decreased productivity. Increasing salt concentrations significantly decreased the number of umbels, fruit yield/plant, and weight of 1000 seeds in fennel, cumin, and Ammi majus. On milk thistle and *Trachyspermum amm*, similar reductions in seed production and yield components per plant were attained (Said-Al Ahl & Omer, 2011).

Photosynthetic pigment

The effects of salt on photosynthetic enzymes, chlorophylls, and carotenoids are clearly demonstrated *Satureja hortensis*, Centaury, *Teucrium polium*, *Thymus vulgaris, Zataria multiflora* and *Ziziphora clinopodioides* all had lower chlorophyll a and b contents and total chlorophyll due to increased saline levels. Both the enhanced breakdown and the reduced synthesis of that pigment may be to blame for the observed decrease in chlorophyll concentration in plants cultivated in saline circumstances. Additionally, the salinity effect's reduction of photosynthetic pigments (chlorophyll a, chlorophyll b, and total carotenoids) (Said-Al Ahl & Omer, 2011).

Conclusion

Herbal medicine use has a long history, and medicinal plants are one of the most significant and significant groups of crops that have been utilised for conventional disease prevention and treatment. The salt sensitivity affects a number of important crops, including pepper, eggplant, potato, lettuce and cabbage. Important cereals like rice and maize are similarly susceptible to hyperosmotic stressors, and their productivity significantly declines on soils with high levels of salt. The high yielding genotypes of these plants are very encouraging, because a substantial number of literatures reports on the response of medicinal and aromatic plants to salinity stress. Currently very little information is available on medicinal and aromatic plants with the plant proteomics and it is a current need of hour more focus on this research area to enlist all the ethnomedicinal plants and their genomics.

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