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Effect of nitrogen on growth and yield of medicinal plants: A review paper

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Abstract: Medicinal plants are those plants which are used for medicinal purposes. ***Medicinal plants are come under herbalism (herbal medicine). From the ancient time herbal plants were used for medicinal purposes. India was rich in medicinal plants from prehistoric time. Different parts of plants are used for medicinal purposes. It has been observed that the contribution of USA in medicinal plants is just 25% whereas India contributes 80% of its share. Medicinal plants are used to treat skin problems, eye irritation, diarrhea, sleeplessness and nausea. The medicinal plants like tulsi, ginger, turmeric and aloe are used for curing several common ailments. Nitrogen is one of the essential plant nutrients. It plays an important role in the life cycle of plant. Nitrogen is the main constituent of amino acids, proteins and chlorophyll. Nitrogen increases the vegetative growth of plants. It also increases the oil content present in the medicinal plants.***

Keywords: Medicinal plants, Herbs and Nitrogen.

1. INTRODUCTION

Medicinal plants are the medicinal herbs. These are those herbs which were discovered and used as medicinal practice from the ancient time. They synthesis some chemical compounds which defend them from insects, fungi, diseases and herbivorous mammals. Medicinal plants synthesis some compounds like alkaloids, glycosides, polyphenols and terpenes. According to WHO, with the rotation of medicinal plants in our cropping system, we can protect our succeeding crop from many pests and diseases (Sharma (2020); ChitraMani & Kumar, P. (2020); Sharma, M., & Kumar, P. (2020); Chand, J., & Kumar, P. (2020); Naik, M., & Kumar, P. (2020); Kumar, P., & Naik, M. (2020); Kumar, P., & Dwivedi, P. (2020); Yaman, (2020); Yaman and Kumar, (2020); Devi, P., & Kumar, P. (2020); Kumari, P., & Kumar, P. (2020); Kaur, S., & Kumar, P. (2020); Devi, P., & Kumar, P. (2020); Sharma, K., & Kumar, P. (2020); Kumar, S. B. P. (2020); Devi, P., & Kumar, P. (2020); Chand, J., & Kumar, P. (2020). Cultivation of medicinal plants also helps in maintaining organic matter in the soil. There are many medicinal plants like turmeric, celery, mint, aloe vera, sunflower, garlic and ginger etc. Different parts of medicinal parts are used as a medicine for example flowers, leafs, stalk, roots, rhizomes and cloves. In ancient time in Sumeria, hundreds of medicinal plants were grown. In Egyptian history 800 medicinal plants were grown such as cannabis, aloe, castor bean, garlic and opium etc. In the 19th century medicinal plants have great importance. The medicinal compounds like alkaloids are isolated from the plant and used as a raw material in many medicinal industries. At the end of the 19th century, various enzymes were used for the activation of medicinal compound present in plant. Now a day, various medicines are prepared for the treatment of various diseases. There are various uses of

medicinal plants. For example, chamomile plant: the flowers of this plant are used to treat wound healing and reduce the swelling. Echinacea plant: roots, leaf and stalk of this plant are used to treat flu, infection and prevent cold. Garlic: the roots and cloves are used to lowering the blood pressure and cholesterol. Ginger: the roots are used to treat nausea and motion sickness. Goldenseal: the roots and rhizomes of the plant are used for the treatment of diarrhea and eye and skin irritation. Ginseng: the roots are used as tonic for immunity purposes. The fruit of milk thistle is used to treat liver condition. The roots of valerian are used for treating sleeplessness and anxiety (Kumar, P. (2019); Kumar, D., Rameshwar, S. D., & Kumar, P. (2019); Dey, S. R., & Kumar, P. (2019); Kumar et al. (2019); Dey, S. R., & Kumar, P. (2019); Kumar, P., & Pathak, S. (2018); Kumar, P., & Dwivedi, P. (2018); Kumar, P., & Pathak, S. (2018); Kumar et al.,2018; Kumar, P., & Hemantaranjan, A. (2017); Dwivedi, P., & Prasann, K. (2016). Kumar, P. (2014); Kumar, P. (2013); Kumar et al. (2013); Prasann, K. (2012); Kumar et al. (2011); Kumar et al. (2014). Nitrogen is one of the essential nutrients which require by plants to complete its life cycle. Nitrogen is a part of primary nutrients. Primary nutrients are those nutrients which require by plants in huge amount. Nitrogen provides energy to plants for growing and producing fruits and vegetables. Nitrogen gives green colour to the plant as it is the part of chlorophyll. It also helps in photosynthesis process for creating food. Nitrogen is the building blocks of proteins. It is the main constituents of protein, chlorophyll and nucleic acids. It gives vigorous growth to plants. It gives vegetative growth and delay the maturity. It makes the plant succulent. The deficiency of nitrogen causes chlorosis in plants i.e yellowing of lower leaves. Deficiency of nitrogen increases the starch content but decreases the protein content. Deficiency symptoms of nitrogen is purple colouration appears in the shoot axis. Wrinkling of cereal grains appears due to the deficiency of nitrogen. Deficiency of nitrogen suppresses or delays the flowering. The excess of nitrogen delay the ripening as it encourages more vegetative growth excess of nitrogen detroits the quality of some crop such as potato, sugarcane and barley etc. it also affects the fruit and grain quality. The excess nitrogen causes lodging and increases straw grain ratio.

1.1 Effect of nitrogen on growth of medicinal plants

It has been noted that the application of nitrogen increased the vegetative growth of plants. A experiment was conducted on medicinal pumpkin. It had been observed that with the increase in quantity of nitrogen, the plant height increased progressively. (H. Aroiee *et al*). Sara Yasemin *et al*.2017 observed that the root length of lavender plant decreased with increase in the application of nitrogen content whereas shoot height increased with increase in the application of nitrogen content. It had been concluded that the nitrogen long with phosphorous and potassium increased the height of plant, morphology of leaf, number of nodes and number of branches of the bellflower. But it was also noted that there was no significant difference in root length of all treatments which indicated that nitrogen had no effect on root length. (Kwon *et al*. 2019). Hossain *et al*. 2007 observed that the application of nitrogen in aloe vera increase the height of plant. Kandil *et al*. 2009 observed that mean height of basil plants significantly increased with the application nitrogen fertilizer. Same results were given by Retana *et al*. 2012. Rahul *et al*. 2016 informed that increased in the dose of nitrogen, the vine length of the coleus plant gradually increased. Shalaby *et al*.2008 concluded that increased in application of nitrogenous fertilizers, increase the growth and yield of *Echinacea purpurea*.

1.2 Effect of nitrogen on seed oil content

It had been noted that the nitrogen had no effect on oil content. A experiment was conducted on medicinal pumpkin. Different types of nitrogen levels were used i.e 0, 75 , 150 , 225 and

300 $kgha^{-1}$. The oil content at nitrogen levels 75 $kgha^{-1}$ and 150 $kgha^{-1}$ were almost similar. Whereas with increase in nitrogen level the oil content became decreased (H. Aroiee *et al*). Ceylan, 1996 observed that nitrogen increases the vegetative growth of herb plants which directly increased the total oil yield. It was observed that the quality of fennel was improved with application of nitrogenous fertilizer. Five nitrogen values (0, 40 kg N/ha, 80 kg N/ha, 120 kg N/ha, 160 kg Nha^{-1}) were used on four fennel varieties (Isfahan, EU11486, Tehran and Yazd). The application of 160 kg N /ha increased the oil content in the fennel and EU1186 was the superior variety which responded to nitrogen.(Ali *et al*. 2012). Ayub *et al*. (2011) conducted the three year experiment in which they reported that with increased in the nitrogen content the oil content of fennel plant was also increased.

1.3 Effect of nitrogen on yield of medicinal plants

The experiment was conducted in which different nitrogen levels (0, 75, 150 kg/ha) were used. It was observed that with the increased in the nitrogen level, the yield of thymus serphyllum was also increased. (Pal *et al* . 2016) . The tuber yield of the coleus plant gradually increased with increased in the application of nitrogen fertilizer.(Rahul et al.2016). Kamlesh ahirwar concluded that the nitrogen level at 200 kg/ha in turmeric plant significantly increased the yield of rhizomes. A research was conducted at Egypt on stevia plant in which nitrogen level had increased from 10 to 30 kg Nha^{-1}. Results showed that the dry leaf biomass yield was increased upto 64 percent as compare to lower dose.(Allam *et al*. 2001). Ingle *et al*. 2004 resulted that combination of 20 tonne fym/ha along with 30 kg N/ha significantly increased the dry tuber yield of safed musali. It had been observed that deduction in the nitrogen levels had good impact on energy balance and environmental pollution. The application of 90 kg N/ha significantly increased the growth and seed yield of isabgol. But the application of 60 kg N/ha was good in terms of cost benefit ratio.(Ashraf *et al*.2006). Zubair (2003) observed that with increase in the application of nitrogen, the umbels and seed yield of the fennel plant was increased.

2. CONCLUSION

Medicinal plants are very useful for us. They are used to treat many ailments of our daily life. Nitrogen has great impact on the medicinal plant. It increases the vegetative growth as well as its yield. But it has no direct impact on the root length and oil content of medicinal plants. Nitrogen is the building block of proteins. It requires by plants in huge amount for their proper growth and development. It requires by plant at different stages of their life cycle.

REFERENCES

[1] Allam AI, Nassar AM, Besheit SY. 2001. nile.enal.sci.eg/Arc Journal/uga.htm.

[2] Aroiee, H. and Omidbaigi, R. (2004). EFFECTS OF NITROGEN FERTILIZER ON PRODUCTIVITY OF MEDICINAL PUMPKIN. Acta Hortic. 629, 415-419 DOI: 10.17660/ActaHortic.2004.629.54

[3] Ashraf M, Qasim Ali, Eui Shik Rha. Effect of Varying Nitrogen Regimes on Growth, Seed Yield, and Nutrient Accumulation in Isabgol, Journal of Plant Nutrition. 2006; 29:535-542.

[4] S. Shalaby, S. E. El-Gengaihi, E. A. Agina, A. S. El-Khayat & S. F. Hendawy (1997) Growth and Yield of *Echinacea purpurea* L. as Influenced by Planting Density and Fertilization, Journal of Herbs, Spices & Medicinal Plants, 5:1, 69-76

[5] Hossain KL, Wadud MA, Kashem E, Santosa MS, Ali. Effect of different nitrogen and potassium rates on agronomic characters of Aloe indica. Bul. Agron. 2007; 35(1):58-62.
[6] Ingle VG, Wankhade SG, Jadhao BJ, Men MU. Effect of manure and fertilizer levels on yield of Safed musali, Agric. Sci. Digest. 2004; 24(4):311-312.
[7] Janaki Pal, R.S.Adhikari and Negi, J.S. 2016. Effect of Nitrogen, Phosphorus and Potassium on Growth and Green Herb Yield of Thymus serphyllum. Int.J.Curr.Microbiol.App.Sci. 5(1): 406- 410.
[8] Kamlesh Ahirwar. Effect of Nitrogen and Potassium Levels on Growth and Yield of Turmeric (Curcuma longa L.), thesis, 2009
[9] Kandil MA, Khatab ME, Ahmed SS, Schnug E. Herbal and essential oil yield of Genovese basil (Ocimum basilicum L.) grown with mineral and organic fertilizer sources in Egypt. J Kulturpflanzen. 2009; 61(12):443- 449.
[10] Kwon, S., Kim, H., Roy, S.K. *et al.* Effects of Nitrogen, Phosphorus and Potassium Fertilizers on Growth Characteristics of Two Species of Bellflower (*Platycodon grandiflorum*). *J. Crop Sci. Biotechnol.* 22, 481–487 (2019).
[11] Rahul S, Phatak, Laxminarayan Hegde, Vijaykumar Narayanpur NK, Hegde. Effect of nutrient doses on growth, seed yield and tuber yield of glory lily (Gloriosasuperba L.) Res. Environ. Life Sci. 2016; 9(5):634-636
[12] Renata Nurzyńska-Wierdak, Ewa Rożek, Katarzyna Dzida, Bartłomiej Borowski. Growth response to nitrogen and potassium fertilization of common basil (Ocimum basilicum L.) plants. Acta Sci. Pol., Hortorum Cultus. 2012; 11(2):275-288
[13] Zubair M (2003). Growth and yield response of fennel to different seed rates and nitrogen levels. M.Sc Thesis, Dept. Of Agron, Uni. of Agric., Faisalabad, Pakistan.
[14] Sharma, M. (2020). Plant Metabolites under Heavy Metal Research. In: *Metal Toxicity in Agriculture Crops: Emerging Trends* 275-296 (Eds: Prasann Kumar and Shipa Rani Dey, Scientific Publishers).
[15] Sharma, M. (2020). Vacuole, Trichome and Hydropotes Sequestration. In: *Metal Toxicity in Agriculture Crops: Emerging Trends* 21-42 (Eds: Prasann Kumar and Shipa Rani Dey, Scientific Publishers).
[16] Sharma, M. (2020). Role of Growth Hormone in Mitigation of Heavy Metal Stress. In: *Metal Toxicity in Agriculture Crops: Emerging Trends* 43-64 (Eds: Prasann Kumar and Shipa Rani Dey, Scientific Publishers).
[17] Yaman & Kumar, P. (2020). Organic Farming and its Need, Importance, Ministries and Constraints for its adoption. Ashok K. Rathoure; Pawan Kumar Bharti and Jaswant Ray (Ed.), Vermitechnology, Farm and Fertilizer (103-111). New Delhi: Discovery Publishing House Pvt. Ltd.
[18] Yaman. (2020). Heavy Metal Detoxification and Signal Transduction Pathway. Prasann Kumar (Ed.), Metal Toxicity in Agriculture Crops: Emerging Trends (387-422). Jodhpur (India): Scientific publisher.
[19] ChitraMani, Kumar, P. (2020). Evaluation of antimony induced biochemical shift in mustard. Plant Archives, 20(2), 3493-3498.
[20] Sharma, M., & Kumar, P. (2020). Biochemical alteration of mustard grown under tin contaminated soil. Plant Archives, 20(2), 3487-3492.
[21] Chand, J., & Kumar, P. (2020). Yield attribute shift of mustard grown under cadmium contaminated soil. Plant Archives, 20(2), 3518-3523.
[22] Naik, M., & Kumar, P. (2020). Role of growth regulators and microbes for metal detoxification in plants and soil. Plant Archives, 20(2), 2820-2824.
[23] Kumar, P., & Naik, M. (2020). Biotic symbiosis and plant growth regulators as a strategy against cadmium and lead stress in chickpea. Plant Archives, 20(2), 2495-2500.

[24] Kumar, P., & Dwivedi, P. (2020). Lignin estimation in sorghum leaves grown under hazardous waste site. Plant Archives, 20(2), 2558-2561.
[25] Devi, P., & Kumar, P. (2020). Concept and Application of Phytoremediation in the Fight of Heavy Metal Toxicity. Journal of Pharmaceutical Sciences and Research, 12(6), 795-804.
[26] Kumari, P., & Kumar, P. (2020). Trichoderma fungus in mitigation of rhizosphere arsenic: with special reference to biochemical changes. Plant Archives, 20(2), 3512-3517.
[27] Kaur, S., & Kumar, P. (2020). Ameliorative effect of trichoderma, rhizobium and mycorrhiza on internodal length, leaf area and total soluble protein in mung bean (Vigna radiata [L.] R. Wilazek) under drought stress. Journal of Pharmacognosy and Phytochemistry, 9(4), 971-977.
[28] Devi, P., & Kumar, P. (2020). Effect of bioremediation on internodal length and leaf area of maize plant cultivated in contaminated soil with chromium metal. Journal of Pharmacognosy and Phytochemistry, 9(4), 1408-1413.
[29] Sharma, K., & Kumar, P. (2020). Mitigating the effect of biofertilizers on morphological and biochemical level in pearl millet grown under mercury toxicity. Journal of Pharmacognosy and Phytochemistry, 9(4), 955-961.
[30] Kumar, S. B. P. (2020). Salinity stress, its physiological response and mitigating effects of microbial bio inoculants and organic compounds. Journal of Pharmacognosy and Phytochemistry, 9(4), 1397-1303.
[31] Devi, P., & Kumar, P. (2020). Enhancement effect of biofertilizers on germination percentage and plant height in maize grown under chromium toxic soil. Journal of Pharmacognosy and Phytochemistry, 9(4), 702-707.
[32] Chand, J., & Kumar, P. (2020). Biochemical shift of mustard grown under cadmium contaminated soil. Journal of Pharmacognosy and Phytochemistry, 9(3), 178-183.
[33] Kumar, P. (2019). Evaluation Of Internodal Length And Node Number Of Pea Treated With Heavy Metal, Polyamines And Glomus. Journal of the Gujarat Research Society, 21(10s), 518-523.
[34] Kumar, D., Rameshwar, S. D., & Kumar, P. (2019). Effect Of Intergated Application Of Inorganic And Organic Fertilizers On The Roots Of Chickpea. Plant Archives, 19(1), 857-860.
[35] Dey, S. R., & Kumar, P. (2019). Analysis of Available Nitrogen of Wheat Cultivated Soil Treated with Organic and Inorganic Source of Fertilizers. Int. J. Curr. Microbiol. App. Sci, 8(8), 2986-2990.
[36] Kumar, P., Siddique, A., Thakur, V., & Singh, M. (2019). Effect of putrescine and glomus on total reducing sugar in cadmium treated sorghum crop. Journal of Pharmacognosy and Phytochemistry, 8(2), 313-316.
[37] Dey, S. R., & Kumar, P. (2019). Cadmium induced biochemical shift in maize. Journal of Pharmacognosy and Phytochemistry, 8(1), 2038-2045.
[38] Kumar, P., & Pathak, S. (2018). Short-Term Response of Plants Grown under Heavy Metal Toxicity. Heavy Metals, 69.
[39] Kumar, P., & Dwivedi, P. (2018). Plant lectins, agricultural advancements and mammalian toxicity. Molecular Physiology of Abiotic Stresses in Plant Productivity, 360.
[40] Kumar, P., & Pathak, S. (2018). Nitric oxide: a key driver of signaling in plants. MOJ Eco Environ Sci, 3(3), 145-148.
[41] Kumar, P., Pathak, S., Amarnath, K. S., Teja, P. V. B., Dileep, B., Kumar, K., ... & Siddique, A. (2018). Effect of growth regulator on morpho-physiological attributes of chilli: a case study. Plant Archives, 18(2), 1771-1776.

[42] Kumar, P., & Hemantaranjan, A. (2017). Iodine: a unique element with special reference to soil-plant-air system. Advances in Plant Physiology (Vol. 17), 314.
[43] Dwivedi, P., & Prasann, K. (2016). Objective plant physiology. Objective plant physiology., (Ed. 2).
[44] Kumar, P. (2014). Significance of soil-root system and aquaporins for water homeostasis in plant-a review. Advances in Plant Physiology (Vol. 15), 15, 324.
[45] Kumar, P. (2013). Food Security and Nutritional Safety: A Challenge Ahead. Journal of Functional and Environmental Botany, 3(1), 12-19.
[46] Prasann, K., Biswapati, M., & Padmanabh, D. (2013). Combating heavy metal toxicity from hazardous waste sites by harnessing scavenging activity of some vegetable plants. Vegetos, 26(2), 416-425.
[47] Prasann, K. (2012). Feeding the future: crop protection today. Acta Chimica and Pharmaceutica Indica, 2(4), 231-236.
[48] Kumar, P., & Dwivedi, P. (2011). Future Habitat Loss: Greatest Threat to the Soil Microbial Biodiversity. Journal of Functional And Environmental Botany, 1(2), 82-90.
[49] Kumar, P., Singh, B. N., & Dwivedi, P. Plant Growth Regulators, Plant Adaptability And Plant Productivity: Areview On Abscisic Acid (Aba) Signaling In Plants Under Emerging Environmental Stresses. Sustaining Future Food Security In Changing Environments, 81.