

Biofertilizers in Potato Production

V. Sravani

Assistant Professor, Department of Horticulture, SKYCAS, Etcherla, Srikakulam, Andhra Pradesh

SUMMARY

Judicious use of chemical fertilizers in combination with PSB (Phosphate Solubilizing Bacteria), VAM (*Vesicular Arbuscular Mycorrhizal*) Fungi, *Azotobacter* and/or mustard cake is beneficial for high grade tuber production in potato and dry matter production..

INTRODUCTION

Potato (*Solanum tuberosum*) is adopted to diverse climatic conditions viz. tropical, subtropical and temperate and grown for production of vegetables or true potato seeds. Potato has a place with solanaceae family, is very popular and important vegetable grown in all over the world. It is the fourth important crop after maize, wheat and rice. India ranks third position in production of potatoes following China and Russia and accounts of 51300 thousand MT to area of 2158 thousand hectares (NHB, 2019 - 20). The dry matter and protein production per unit area is higher than common cereals so potato is considered as staple crop in many parts of world. Due to high nutritional and energy value of potato tuber and very high economic outputs potato is most suitable crop for developing countries. Potatoes also have some medicinal value beside economical and nutritious food source. Tuber is modified stem and economic part of potato. A potato tuber contains about 80 % water and rest as dry matter. Starch accumulates about 70 % of total solids. It has very high capacity of dry matter production (47.6 Kg/hectare/day). Average composition of potato tuber is: dry matter (20 %), starch (13 – 16 %), total sugar (0 – 2 %), protein (2 %), fibre (0.5 %), lipids (0.1 %), vitamin C (31 mg/100g fresh weight), ash (1 – 1.5 %) and vitamin A and minerals in trace. It is low energy food (97 K cal/100g fresh weight).

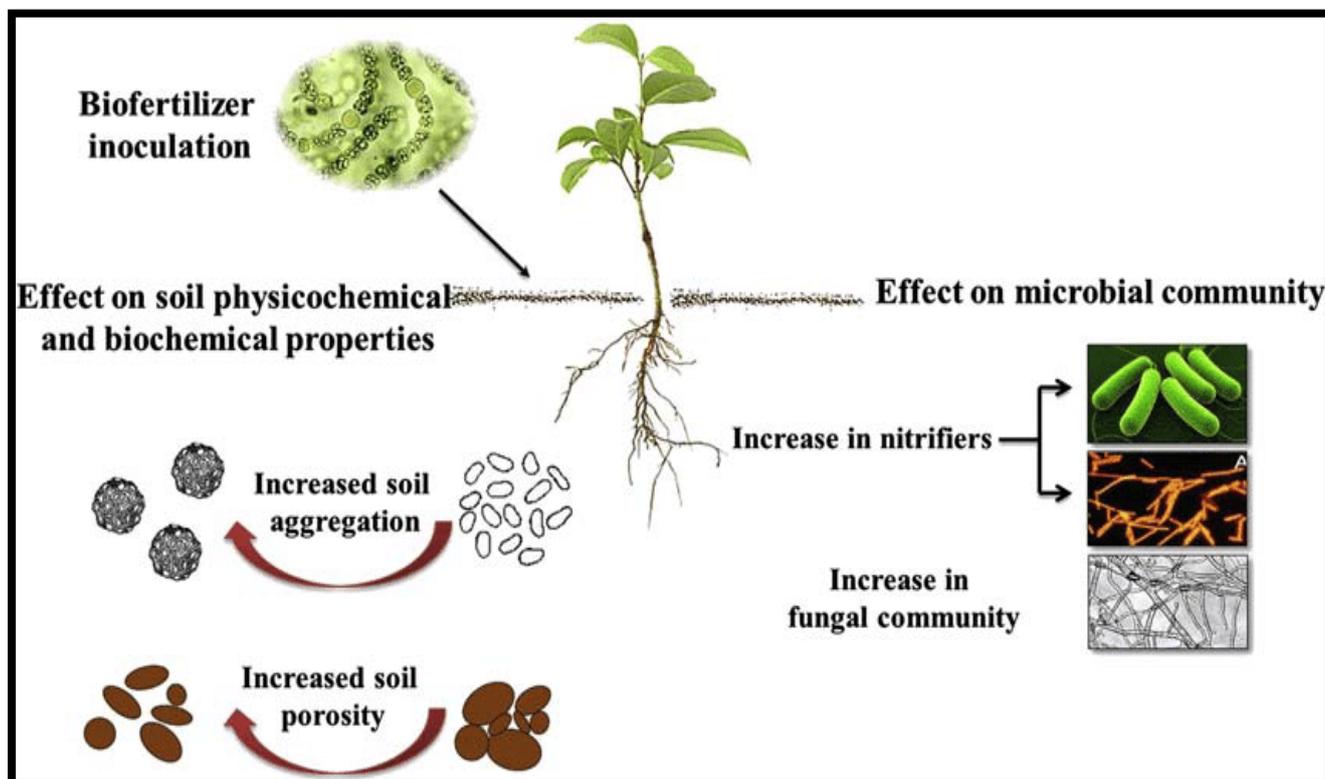
Plants mostly take nitrogen in the form of nitrate and utilize them for synthesis of nucleic acids, proteins, chlorophyll and many nitrogen containing compounds. Potassium is a major cation in phloem and has been reported to promote phloem transport of photosynthates. The problem of malnutrition and under nutrition can be easily solved if potato is accepted in our country as a major food and not merely as a vegetable in our country. Potato crop needs a perfect balanced fertilization or else the development and growth of the crop will be poor and ultimately will affect the yield and quality of tubers. The abundance and low cost of N fertilizer has encouraged the farmers to use the high fertilization rates in attempts to obtain maximum tuber yields. Plant take nitrogen in form of nitrate and ammonium ion and utilize them for synthesis of nucleic acids, proteins, chlorophyll and many nitrogen containing compounds (Lea and Ireland, 1999). The balance between absorption, translocation and assimilation of nitrates in the plant body is essential and if this balance is disturbed most of the nitrate is concentrated to the root and tubers (Cash *et al.*, 2002). High level of Nitrate in potato tuber; (> 67 ppm) leads to high nitrate concentration in human body, which is further reduced to nitrite. High nitrite concentration may cause meth hemoglobinemia or may combine with amino acids to form a potential carcinogenic substance called nitrosamine.

Excess application of nitrogen not only damages the crop quality and environment but also represents unnecessary economic expenditure of the farmers. The high cost of chemical fertilizers along with the related ecological and health hazards necessitate finding out the alternate nutrient sources to sustain the crop yield without any adverse effect on environment. Application of organic materials like compost and biofertilizers can add and compensate the nutrient loss from soil. These organic materials will also help to restore, maintain and improve soil fertility to increase production in the given set of soil and climate. Tuberization in potato is function of nutrient uptake and utilization by plants. Fertilizer scheduling in terms of dose, time and sources of nutrients is determining factor for potato tuber formation and development. Effective nutrient scheduling ensures better emergence and survival of plants, stimulates vegetative growth, branching, improves photosynthetic activities, increases tuber yield and income to farmers. Balanced fertilization of potato plants is essential to improve nutritional value and tuber quality. Availability of nutrients from multiple sources ensures effective nutrient utilization in comparison

to single source thus, application of inorganic fertilizers in combination with vermicompost and biofertilizers has been reported for economic and quality potato production.

Biofertilizer contains living cells of various microbes that have the ability to make the nutrients available to the plant through solubilisation of unavailable nutrients like phosphorus and potassium or fixation of atmospheric minerals like nitrogen. Application of biofertilizer reduces consumption of inorganic fertilizers by 20 - 50% and can improve the crop yield by 10 - 20%. Microbial biomass, present in biofertilizers, add organic matter to soil so can improve soil fertility and can be better option than FYM for improving potato tuber yield. Considering the positive impact of nutrients to enhance the yield and negative impact of inorganic sources (chemical fertilizers) over the soil and plant health, biofertilizers application in combination with chemical fertilizers to improve the growth and yield of potato. Combination of 50 % RDF + PSB + Azotobacter + VAM + Mustard cake were reported with low soil pH; high soil organic matter; high availability of nitrogen, phosphorus and potassium; lower nitrate content in tuber; and high mineral content in both pulp and skin. Thus, replacement of 50% of RDF with application of PSB in combination with VAM, Azotobacter or Mustard cake is most suitable INM practice for good soil health, lower nitrate toxicity and better tuber quality in potato grown under subtropics (Lallawmkima *et al.* 2018).

Mode of Action:



CONCLUSION

The increase in number of tubers was result of efficient utilization of nutrients by the plant under the influences of microbial activity of biofertilizers (Singh and Lallawmkima, 2018). Combined inoculation of potato tuber with Azotobacter and PSB showed significantly higher plant height, number of leaves, tuber weight and tuber yield. So, these two bio fertilizers (Azotobacter and PSB) along with normal doses of major other fertilizers like N, P and K may be recommended to the potato growers to get higher yields and to prevent losses and to increase the overall production of potato. Azotobacter plays healthful stimulatory and remedial part for the advantage of yield, which makes it a potential bio-manure for potato. Likewise PSB solubilises phosphorus from soil source and makes it accessible to plant (Ramandeep *et al.* 2018).

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