Seed Treatment: A Good Tool for Potato Crop Management

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Abstract: The present report is based on the effect of various seed treatments on the yield attributes of potato crop. Higher yield and proper tuber size in terms of seed potato and ware potato is a very important aspect to full fill the requirement of seed potato producers/ farmers and for all the population of the country, because of increasing consumption of potato day by day. The poor fertilizer management i.e. improper use of manures and fertilizers is one of the reasons for poor yield. Dormancy of potato tuber is defined as the physiological state in which autonomous sprout will not occur, even when the tuber is placed under ideal conditions for sprout growth. So Seed treatment may be an important substitute for soil fertilization and a good tool in crop management to maximize yields of crops.

[Anoop Badoni. **Seed Treatment: A Good Tool for Potato Crop Management.** *Rep Opinion* 2017;9(10):36-39]. ISSN 1553-9873 (print); ISSN 2375-7205 (online). http://www.sciencepub.net/report. 7. doi:10.7537/marsroj091017.07.

Key words: Seed treatment, potato, thio-urea and KMB

A report on necessity and advantages of seed treatment in Potato crop:

The importance of potato (*Solanum tuberosum* L.) as one of the world's major staple crops is increasingly being recognized, because it produces more dry matter and protein per hectare than the major cereal crops. The nutritional value of potato tubers is a key factor for its progressive production, along with the economic benefits that potato cultivation can bring to developing countries (Van Gijessel, 2005; McGregor, 2007). As a crop of high biological value for its protein and a substantial amount of vitamins, minerals and trace elements, potato is undoubtedly a very important crop in the country (Gebre and Sathyanarayana, 2001). Potato has the fourth rank amoung foods in terms of importance after wheat, rice and corn in the world (Germchi, *et al.* 2011). Higher yield and proper tuber size in terms of seed potato and ware potato is a very important aspect to full fill the requirement of seed potato producers/ farmers and for all the population of the country, because of increasing consumption of potato day by day. Potato is a global crop planted in a wider range of altitude, latitude, and climatic conditions. No other crop can match the potato in its production of food energy and food value per unit area (Davies et al., 2005). Nutrition analysis showed that potato is a healthy food in terms of vitamins, minerals, proteins, antioxidants, essential amino acids and carbohydrates (Andre et al., 2007). However, there are many problems surrounding potato cultivation. One problem is that potato plant has one of the heaviest production demands for fertilizer inputs of all vegetable crops.

The poor fertilizer management i.e. improper use of manures and fertilizers is one of the reasons for poor yield (Islam *et al*., 1982). Nitrogen plays a major role in the production and maintenance of an optimum plant canopy for continuing tuber growth through long growing period (Westermann and Kleinkopf, 1985). Nitrogen fertilizer application is considered as one of the most important factor which limits production of potato (Tran and Giroux, 1991). Nitrogen has very low use efficiency and is lost easily due to which crop cannot use it and hence it increases economic concerns as crop production is less. Nitrogen which is not used by the crop is lost through leaching, runoff, volatilization and denitrification. This lost nitrogen increases contamination of water and gas emissions from greenhouse. If nitrogen losses are reduced, crop nitrogen-use efficiency can be enhanced (Engelsjord *et. al.,* 1997). The nitrogen losses can be minimized by using appropriate method of its application. Normal fertilizer application is around 1000 kg ha-1 10N-3P2O5-10K2O. N requirements are as high as 336 kg ha-1 in traditional production system for an expected yield of 5000 kg ha-1 (Davies et al., 2005; Lang et al., 1999). Current agriculture are facing increased cost of synthetic fertilizer, (agro) ecosystems desiccation caused by extensive use of water in crop production (Whitley and Davenport, 2003) and subsequent reduction in water supplies for irrigation, heightening publication about the environmental and healthy impact of biocide overuse (Lotter, 2003), and the nitrate leaching from overuse of fertilizers, therefore, a new program must be developed to address these challenges. Dormancy of potato tuber is defined as the physiological state in which autonomous sprout will not occur, even when the tuber is placed under ideal conditions for sprout growth (Rehman *et al.* 2001). Among the chemicals applied for breaking down the potato nodes dormancy, thio-urea, a catalyze inhibitor which tiggers potato tubers germination and healing tubers injuries especially when it is applied in an appropriate concentration (F. Mani *et al.* 2013). Also many studies reported that thio-urea treatment is not only more efficient to break dormancy but it increases also sprouts number, comparing to other chemicals like IAA and GA3 (Germchi *et al.* 2010). In addition, earlier workers also reported that thio-urea has great influence on yield and quality of potato tubers (Panah *et al.* 2007), but the impact of thio-urea on plant growth and on quality of potato tubers is not well established. According to Rahman *et al.* 2003; Panah *et al.* 2007; Mani *et al.* 2011, treating tubers with thio-urea is efficient to break dormancy, but its impact on yield is not well established. Thereafter, applying beneficial microbial inoculants are emerging as a promising alternative for maintaining a sustainable agriculture system. Evidence shows that maintenance of sustainable soil fertility depends greatly on the ability to harness the benefits of plant-growth-promoting bacteria (PGPB) such as N-fixing, P-solubilizing bacteria (PSB), mycorrhizal helper bacteria (MHB), endophytes, and arbuscular mycorrhizal fungi (AMF) (Barea et al., 2005; Smith and Read, 2008). The special focus on K solubilizer was due to the fact that potassium is one of the major nutrients required by all crops. It is a key element in many physiological and biochemical processes. Mineral potassium solubilization by microbes which enhances crop growth and yield when applied with a cheaper source of rock potassium may be agronomically more useful and environmentally more feasible than soluble K (Rajan *et al.,* 1996). Potassium solubilizing bacteria are capable of solubilizing rock K, mineral powder such as mica, elite and orthoclases through production and excretion of organic acids (Fridrich *et al.,* 1991).

Current interest in the potassium fertility of soil has been changed from simple estimation of exchangeable K to measurement of the rate at which K is supplied from exchangeable fractions. Rate of non exchangeable K release and its mechanism are controlled by nature and amount of clay minerals, besides this exploring the role of microbes present in the soil also stared this exploring the role of microbes present in the soil also starded recently. According to preliminary studies and crop response studies gives encouragement in this line (Chandra *et. al.,* 2000, Chandra *et. al.,* 2005). An interesting finding was made from Banana rhizosphere by Dr. Krishna Chandra during 1998 and noticed a microbe is predominant and play vital role in help plants in potassium nutrient uptake. Later it was authenticated by Institute of Microbial Technology (IMTECH), Chandigarh as *Frateuria aurentia* and known as Potash Mobilizing Bacteria (KMB), belonging to the family Pseudomonaceae. KMB is a beneficial free living soil bacteria isolated from rhizosphere of plants, which have been shown to improve plant health or increase yield are usually referred to as plant growth promoting rhizobacteria - PGPR (Kloepper *et. al.,* 1980). A number of different nitrogen fixing and phosphate solubilizing bacteria may be considered to be PGPR including *Azotobacter, Azospirillum, Rhizobium* other bacterial genera e.g. *Arthrobacter, Bacillus, Burkholderia, Enterobacter, Klebsiella, Pseudomonas* etc. also reported as PGPR. According to Chandra *et. al.,* 2005 and field trials, *Frateuria aurentia* also to be considered as PGPR. So, Seed treatment may be an important substitute for soil fertilization and a good tool in crop management to maximize yields of crops.

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10/16/2017