

Effect of Speciality Fertilizers v/s Yield and Quality of Selected Crops

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Abstract: *Speciality fertilizers are high analysis innovation products first introduced about 20 years back in Maharashtra. It's fully water soluble solid and it's having high content of primary nutrients content with low salt index. They may or may not have secondary and micronutrients. These fertilizers have different N P K ratios with advantage of foliar application and also fertigation. The foliar application of water soluble fertilizers play an important role in supplying nutrient at critical stage of flowering and fruit development. ToTo day the demand of speciality fertilizers is increasing in most of the crops to enhance the the End quality of the crops.*

Keywords: Speciality fertilizers

1. Introduction

Speciality fertilizers are high analysis innovative products first introduced about 20 years back in Maharashtra. Speciality fertilizers are fully water soluble solid fertilizers, having high content of primary nutrients with low salt index. They may or may not have secondary or micro nutrients. These fertilizers have different ratios of N, P and K. These water soluble fertilizers can advantageously be utilized for foliar feeding and fertigation. Thus help in precision agriculture. There is a wide gap between world and Indian productivity of different crops especial horticultural crops, to overcome this gap may specialty fertilizer plays a vital role in improves the productivity of crops in India. Specialty fertilizers are made with well balanced nutrient proportions, which meet exact nutrient requirements for the crops. Today the demand for speciality fertilizers is increasing in most of the horticultural sectors in the states of Maharashtra, Karnataka, Andhra Pradesh, Tamil Nadu, Gujarat, U.P. and Haryana. The speciality fertilizer may consider as a source of nutrients after plant growth regulators, pesticides and herbicides to achieve crop productivity (Anonymous 2012). The specialty fertilizers have a great contribution to modifying and controlling the growth behaviour of crops in horticulture to boost up production and productivity. The speciality fertilizers can be grouped as 100 % water soluble fertilizers, fortified fertilizers and customized fertilizers and slow / control release fertilizers. These water soluble fertilizers with low salt index, high fertilizer use efficiency (WSF @ 80-85%) with high purity applied in low doses give high Benefit: Cost ratio. Customized fertilizer is a soil-crop-climate based fertilizer and is less influenced by soil, plant and climatic conditions that lead to more uptake of nutrients.

Here we are more concentrating on water soluble fertilizers discussed below due to Foliar application of water soluble fertilizers plays an important role in supplying the nutrients at critical stages of flowering and fruit development stage of crops to improves the production of crops.

Current status of speciality fertilizers

- Speciality fertilizers were first introduced about 20 years back in Maharashtra and their use has spread in horticultural crop growing areas in India.
- The annual consumption of water soluble fertilizers is estimated about 60,000 Mt
- Globally the use of specialty fertilizers constitutes nearly 4 – 5 % of totally world fertilizer consumption

The speciality fertilizers can be grouped in

- a) 100 % water soluble fertilizers
- b) Fortified fertilizers
- c) Customized fertilizers
- d) Slow and control release of fertilizers

Water Soluble fertilizers (WSF)

- 100% Water soluble fertilizers with low salt index, chloride content and high fertilizer use efficiency
- High purity, applied low doses and give high benefit : cost ratio FUE of WSF @ 80-85% Fertilizer Use efficiencies of conventional fertilizers N- 30- 45% P- 10-30% K-50%
- This leads to lower return on money spent on per unit of fertilizer, along with increased soil salinity

Table 1: Comparison between the conventional fertilizers with 100% water soluble fertilizers

Sl. No.	Properties	100% water soluble fertilizers	NPK conventional fertilizers – complex mixture
1	Solubility	Readily soluble in water	Nutrient may be in soluble form but carrier material not fully soluble
2	Uniformity of nutrients ions	Ionic distribution uniform depending upon concentration and composition of base material used	Ionic distribution not uniform as phosphatic ion fixation with other elements in carrier occurs frequently
3	Solubility time	1 to 4 minutes in water	12 to 24 hours at 25 ⁰ C water
4	Filtration of solution before application	Not required	Required 2-3 times

5	pH of 1% solution	Acidic varied 2.5 – 6.5	Neutrality/slightly alkaline 7.5-8.0
6	Salt index	8 to 40	Varies depending upon K ₂ O source (if derived from MOP varies upto 50-125)
7	Time of application	Every irrigation application is possible, absorption by plants over come deficiency	Maximum 2 or 3 split doses. Not practical apply at the time of its demand i. e. flower initiation, fruit setting.
8	Microbial population	More due to less concentration of nutrient solution present near root zone and salt Cl and Na free	Less due to more application of one time dose releases more concentration solution which affects population, Cl, Salt index and Na affects population
9	NUE	Very high	Higher if split doses not applied

Fortified fertilizers

- Fortified fertilizers are a group of straight and complex fertilizers fortified with secondary and/or micronutrients.
- Application of fortified fertilizers with micronutrients will help to mitigate the deficiency of micronutrients (zinc and boron)

Table 2: 100 % water soluble complex fertilizers and fortified fertilizers

Sl. No.	100 % Water Soluble Complex Fertilizers	Fortified Fertilizers
1	Potassium nitrate (13-0-45)	Boronated single superphosphate (16% P ₂ O ₅)
2	Mono potassium phosphate (0-52-32)	Zinc coated urea
3	Calcium nitrate	Zinc coated phosphate (suspension)
4	NPK(13-40-13)	Zincated NPK (12:32:16:0.5)
5	NPK(18-18-18)	Zincated NPK (10:26:26:0.5)
6	NPK(13-5-26)	Boronated DAP)18:46:0:0.3)
7	NPK (6-12-36)	Boronated NPK (12:32:16:0.3)
8	NPK(20-20-20)	Boronated NPK (10:26:26:0.3)
9	NPK(19-19-19)	Calcium nitrate with boron
10	Potassium magnesium sulphate	15:15:15:0.3B
11	Mono ammonium phosphate (12-16-0)	DAP:0.5 Zn
12	Urea phosphate (17-44-0)	SSP:0.5 Zn

2. Customized fertilizers

“Customized fertilizers may be defined as multi-nutrient carrier which contains macro and/or micronutrients, whose sources are from inorganic or organic which are manufactured through synthetic process of granulation and satisfies crops nutrient demand, specific to area, soil and growth stage of plant”.

Advantages

- It supplies the plant available nutrient in adequate amount and in proper proportion.
- Customized fertilizers is a soil-crop-climate based fertilizer and is less influenced by soil, plant and climatic condition that lead to more uptake of nutrients and less loss of nutrient.
- Customized fertilizers supplies not only primary nutrients but also secondary and micronutrients.
- Customized fertilizers reduce the cost of fertilizer application that ultimately reduces cost of cultivation.
- Customized fertilizers are a major component of Site Specific Nutrient Management and Precision Agriculture, which promotes maximum fertilizer use efficiency of the applied nutrients in a cost-effective manner.
- Soil health can be improved by developing site and crop specific fertilizers.

Table 3: Different Customized Fertilizer Formulations available in India

Sl. No	Crops	Formulations (N:P:K:S:Zn:B)/ N:P:K: Zn/ N:P:K:S:Mg:Zn:B:Fe/N:P:K:S:Zn:B)	Geography
1	Potato	8:16:24:6:0.5:0.15	Agra, Aligarh, Budaun, Bulandshahar and Baghpath
2	Wheat	10:18:25:3:0.5:0	Muzaffarnagar, Barielly, Bijnore, Hathras, Pilibhit, Mathura, Meerut
3	Sugarcane	7:20:18:6:0.5:0	Moradabad, KR Nagar, Farukhabad and Ferozabad
4	Rice Paddy	8:15:15:0.5:0.15:0 15:32:8:0.5,18:33:7:0.5, 18:27:14:0.5	GB Nagar, Ghaziabad, Rampur, Shahjahanpur, Mainpuri and US Bagar Andhra Pradesh
5	Rice(Basal)	11:24:06:3:0.5	Adilabad, Nizamabad and Medk
6	Maize (Basal)	14:27:10:4:0.5 14:20:15:4:0.6:0	Karimnagar, Warangal and Ranga Reddy Nizamabad
7	Grape, Sugarcane	10:20:10:5:2:0.5:0.3:0.2	Aurangabad, Nasik, Pune and Ahmednagar
8	Grape, Pomegranate, Paddy, Sugarcane, Tomato, Gourds and Leafy vegetables	20:10:10:5:2:0.5:0.3:0.2	Nasik, Dhule, Jalgaon, Pune, Ahmednagar and Aurangabad
9	Grape, Cotton, Onion,	15:15:15:5:2:0.5:0:0.2	-do-

	Banana, Tomato, Gourds & Leafy and Vegetable		
10	Sugarcane, Citrus	10:20:20:3:2:0.5:0.3:0.2	-do-
11	Groundnut	15:15:15:9:0.5:0.2	Andhra Pradesh
12	Maize	20:0:15:0:0:0.2	Andhra Pradesh
13	Groundnut (Basal)	17:17:17:4:0.5:0.2	Anantapur, Chittoor, Kadapa, Kurnool and Mahaboobnagar.

Effect of foliar feeding of 100 % water soluble fertilizers on yield and quality of crops

Significant increase in fruit yield in chilli was observed due to foliar application of one per cent 19:19:19 fertilizer at 60 and 90 DAT. Two foliar applications of one per cent 19:19:19 water soluble fertilizer enhanced pungency in chillies, while two foliar applications of KNO₃ at the same concentration significantly enhanced colour value and oleoresin yield (Somimol 2012). Foliar application of 19:19:19 (1%) + Fe-EDTA (0.5%) + Borax (0.5%) at 60 and 90 DAT has resulted in higher yield and uptake of nutrients (N, P, K and Fe) in chilli (Veerendra Patel 2014) and (Neelgar 2012). The application of 87.5 RDF + Water-soluble fertilizers (19:19:19, 13:0:45, and 0:52:34) were applied @ 2% (20 g L⁻¹) at different stages of growth shows significant tomato yield and quality was reported by Kamal Narayan *et al.* (2011). To improve the tobacco leaf yield and quality of tobacco, application of SOP, half at transplanting and remaining half at the time of topping combined with one foliar spray of SOP (water soluble grade) at 0.5 per cent on 30th day after topping is recommended by (Ashwitha 2016). Based on yield and quality parameters, the treatment receiving FYM + 100% RDF + foliar spray of fertilizers (11:36:24 + Trace elements) @ 2.00 % at 30 days after sowing (DAS) + Foliar application of booster dose of water soluble grade fertilizer (8:16:39+ Trace elements) @ 2.00% at 45 DAS and 60 DAS was found superior in groundnut was found by Manasa *et al.* 2015. The Foliar application of soluble starter NPK @ 2 per cent + sulphur spray @ 2 per cent at 45 DAS and soluble booster NPK @ 2 per cent + boron spray @ 0.15 per cent at 65 DAS recorded the highest seed yield and quality of soybean. Shivamurthy and Biradar (2013) was reported by the Soil application of MgSO₄ (25 kg ha⁻¹) + 3 foliar sprays of 1% MgSO₄ and 1% 19:19:19 water soluble fertilizer at 70, 90 and 110 DAS along with RDF +FYM or soil application MgSO₄ (25 kg ha⁻¹) + 3 foliar sprays of 1% MgSO₄ and 2% KNO₃ at 70 90 and 110 DAS along with RDF +FYM appears to be better for increasing yield of Bt cotton. To gain higher productivity and quality of Bt cotton in Vertisol, application of 100% RDF + two sprays of starter and booster (11:36:24 and 8:16:39 fertilizers respectively) at boll development stage is highly beneficial. Sepciality fertilizers enhance nutrient absorption through foliage and indirectly build up soil fertility Waikar *et al.* 2015. Pigeonpea performed better with application of 1.0% foliar spray of 19:19:19 both at peak flowering and pod development stages which has recorded higher benefit. Mallesha 2013. To get maximum productivity and higher nutrient uptake from rainfed hybrid maize crop should be fertilized with RDF + FYM @ 7.5 t ha⁻¹ + ZnSO₄ @ 10 kg ha⁻¹ (POP) + 18:18:18 @ 1.0% + Multi-K @ 1.5% found by the Mavarkar *et al.* 2016.

3. Conclusion

Hence. Concluded that foliar nutrition with highly water soluble fertilizer can enhance the yield and quality parameter of the crops and increases the productivity of crops and also eliminate the problems like immobilization of nutrients and nutrient fixation in soil, volatilization loss nutrient like nitrogen. Foliar nutrients usually penetrate the cuticle of the leaf or stomata, enter the cell rapidly and fulfill the nutrient demand of the growing plant and ameliorate nutrient deficiencies rapidly.

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