

## Foliar Fertilization: An Approach To Enhance Nutrient Use Efficiency and Crop Production

**Pramod Kumar\***, Ashok Choudhary<sup>1</sup>, Sheilendra Kumar<sup>2</sup>, Bheem Pareek<sup>3</sup> and P.S. Shekhawat<sup>4</sup>

\*CCS Haryana Agricultural University, Hisar-125004

<sup>1&2</sup>SK Rajasthan Agricultural University, Bikaner-334006

<sup>3</sup>CSK Himachal Pradesh Agriculture University, Palampur-176062

<sup>4</sup>Director Research, SK Rajasthan Agricultural University, Bikaner-334006

\*Corresponding author's e-mail id: pramodthory70@gmail.com

**ARTICLE ID: 077**

Foliar fertilization is a technique of feeding plants by applying liquid fertilizer directly to their leaves. Foliar feeding has been used as a means of giving supplemental doses of major and minor nutrients, plant hormones, stimulants and other beneficial substances. Observed effects of foliar fertilization included yield increases, resistance to diseases and insect/pests, improved drought tolerance and enhanced crop quality. Plant response is dependent on species, fertilizer form, concentration and frequency of application as well as the stage of plant growth. Foliar applications are often time to coincide with specific vegetative or fruiting stages of growth. The soil application of any fertilizer including organic and commercial forms for higher crop production may be relatively inefficient due to biological, chemical and physical properties of the soil that can decrease nutrient availability. Increasing cost of commercial fertilizers (nitrogen, phosphorus, and potassium) also make their non-traditional fertilizer applications, specifically foliar fertilization is more attractive, but foliar fertilization take care of all the plant's nutrient needs. Foliar fertilization is generally used for better management of nutritional status, growth, to correct deficiencies quickly, and improve disease resistance for better crop quality.

Soil application is most common method to supply essential nutrients to plants. In this case applied nutrients are absorbed by plant roots. However, higher plants can also absorb mineral nutrients when applied as foliar sprays in appropriate concentrations. However, in modern high yielding cultivars, nutritional requirements (macronutrients) are rarely met with foliar applications. Furthermore, foliar application of macronutrients requires several sprays, can also be washed off by rain, plant should have sufficient leaf area for absorption and leaf

damage by high nutrient concentrations is a serious practical problem. Despite these drawbacks, under certain circumstances foliar application is most effective methods to correct nutritional disorder. For example, iron deficiency in calcareous soils can be corrected by foliar application of ferrous sulphate or iron chelates solution more efficiently than the soil application of iron sources. Other advocated foliar fertilization as a visible economic way to supplement the plants' nutrients for more efficient fertilization. Furthermore, interest in foliar sprays increased because the development of high concentration soluble fertilizers and the increasing use of machinery for spraying fungicides, herbicides, and insecticides and overhead irrigation further facilitate the application of nutrients to crops in the form of sprays. Advances in agriculture include reducing the cost of crop production, maintaining soil quality, and potential increasing of agro-ecosystems, human, and animal health. Use of nutrients in adequate amounts and its methods of application associated with these objectives. The objective of this review is to discuss latest advances in foliar fertilization and reveal gaps in the existing knowledge and to reflect on both.

#### **Objectives of foliar fertilization:**

- To stimulate the production process of high yielding crops by application at deficit peak / critical requirements.
- To promote crop growth under adverse conditions (Stress).
- To improve nutrient use efficiency.
- To reduce chemical load.

#### **Factors influencing foliar fertilization:-**

##### **Air temperature:**

In higher temperature it causes evaporation of nutrition and decreases the effect of spray solution.

##### **Relative humidity:**

High relative humidity increases nutrient absorption and also maintains turgidity of cell, uptake is lower at the time of low relative humidity.

##### **Post-application irrigation:**

Irrigation after foliar spray is neglected due to solution may down word movement to the soil.

**Time of day for application:**

Foliar spraying should be done at early in the morning and in the late evening it is most profitable.

**Rainfall:**

- Foliar spraying should not be done immediate after and before rainfall.

**Advantages of Foliar Fertilization:-**

**Higher Yields:** Foliar fertilizer gives extra boost for growing to their truly potential.

**Healthier Plants:** Foliar fertilizer provides extra nutrients that plant may need to boost its immunity against pest and disease incidence.

**Immediate Results:** The stomata of a leaf have the ability to soak up the nutrients quickly.

**Less expensive:** One of the most significant benefits of using a foliar fertilizer is that it is cheap as compared to many other means of boosting crop plant growth.

**Ideal Period for Foliar Spray**

The cuticle is more permeable when swollen. Foliar Fertilization should be carried out at times when the relative humidity of the air is high i.e. in the early hours of the morning and in the evening, not during the hot hours of the day. Another advantage is the spray deposit evaporates more slowly and so there is less danger to the leaves being burned by bright sunlight. The high humidity in the evenings and during the night causes the nutrients from dried spray deposits to be dissolved so that they can enter in the leaves.

**Components of Foliar Fertilization**

**1. Liquid fertilizer:-**

Materials added to the soil or applied directly to crop foliage to supply elements needed for plant nutrition. These materials may be in the form of liquid, aqueous solutions. Liquid fertilizers provide plants with concentrations of easily-absorbed, soluble nutrients, thereby enhancing their health and productivity.

**2. Water soluble fertilizer:-**

A powdered and granule synthetic fertilizers that is mixed with water and poured on the soil or sprayed on the foliage of plants. Water Soluble Fertilizers are Urea, Urea

phosphate, Magnesium Sulphate, Potassium Sulphate, Ammonium Sulphate, NPK 18-18-18, NPK 15 -30- 15.

### 3. Sticker:-

Sticker is the agent which improves the adhesion of spray droplet on target plant. A fertilizer is fairly water soluble, it may be washed off the leaf during heavy rainfalls that follow deposition.

### 4. Neutralizing agent:-

It is a foam concentrate formulation that can be mixed with either acid or alkaline water-based solution and discharged through an air-aspirated foam discharge device to produce an expanded foam. The foam produced is extremely stable, meaning that it will slowly release its solution from the bubble walls and neutralize the spill.

#### Keys to success

- Understanding the interaction between the leaf surface and the foliar material.
- Uptake and mobility.
- Spray coverage, droplet size, etc.
- Understanding product quality—avoid Chloride and Nitrate based products especially.

#### Foliar application may be preferred under the following conditions

- When visual symptoms of nutrient deficiencies observed during early stages of deficiency.
- When unfavorable soil physical and chemical conditions which reduce fertilizer use efficiency (FUE).
- Small quantity of micronutrient is needed to apply and it cannot be applied effectively through root or soil.
- During drought period where in the soil application could not be done due to lack of soil moisture.
- Foliar application is effective for the application of minor nutrients like iron, copper, boron, zinc and manganese.

#### Conclusion

Foliar feeding is a very effective short term solution for certain nutrient deficiencies and perhaps during the time of stress. However, the greater degree of the deficiency of nutrient is less likely to be corrected completely with foliar fertilization. Foliar fertilizer applications increases plant growth, fruit set and yield in case of limited availability of nutrients essential for flowering and fruit set due to reduced transpiration and/or nutrient acquisition by the roots. If a visual micronutrient deficiency is observed, micronutrient fertilizers should be applied as foliar spray as soon as possible.

