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Liquid Fertilizer Application System on Planting Mechanism a concept...

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INTRODUCTION

Different crop cultivation practices are carried out to cultivate the crops wiz. land preparation, sowing, intercultural operations, harvesting. Dealing with the sowing, it can be done by different equipments such as seed drill, ridger planter, disc planters etc. As the seeds are placed in the soil they must need some nutrients to enhance their growth. So for the enhancement of the crop growth in the very initial stage and to increase the immunity of crop against the diseases we need fertilizer application one of the strategies to boost farm productivity is by means of agricultural intensification. However, the process of intensification in agriculture depends on the sufficient supply of plant nutrients to the crops for assuring high yield of the cotton crop.

Fertilizer is any organic or inorganic material that is added to soil to supply one or more plant nutrients essential to the growth of plants. Conservative estimates report 30 to 50% of crop yields are attributed to fertilizer. Fertilizer is a key player to enhance crop production by upgrading soil fertility. It also serves as a key for securing the food requirements of a country. None of the country has been able to boost agricultural productivity without making expansion in the use of chemical industry. Balanced fertilization refers to application of essential nutrients of plant, chiefly the major nutrients-Nitrogen (N), Phosphorous (P) and Potassium (K) in optimal quantities through accurate method and application time in precise proportion (Alam and Khan 1999). Balanced fertilization leads to enhance the yield of crops, quality of crops and farm income. Further it serves as a remedy to correct soil nutrient deficiencies and helps in maintaining the soil fertility.

Fertilizers can be applied to soil in Solid and Liquid form.

Techniques of Fertilizer Application In Solid Form

1. Broadcasting : Fertilizers may be broadcast on the surface manually then tilled or watered into soil, or banded on or beneath the soil surface.

2. Top/Sidedressing : In this method granular fertilizers are placed on the seeds or just beside the seed at some distance by means of seed cum fertilizer drill and planters.

Techniques of Fertilizer Application In Liquid Form

1. Broadcasting : Different liquid fertilizers are sprayed on the agricultural field before sowing. It can be done by attaching spraying arrangement on tractor or by mannual means.

2. Starter Solution : Fertilizers can be applied at the time of sowing on the seeds or at side of the seeds by attaching fertilizer application attachment on seed drill or planter.

3. Banding : Application of the fertilizers at the side of seeds after 6-7 days of emergence.

Liquid fertilizer application has many advantages over solid fertilizer application such as,

1. Liquid fertilizers are homogeneous solutions while dry blends can vary in consistency as batch to batch
2. Pure grade Solutions does not settle down or segregate in tank while dry blends can segregate during transportation or in fertilizer dry box
3. Liquid fertilizers are non-corrosive while most of the dry fertilizers are corrosive
4. Liquid fertilizers are unaffected by high humidity and rainy weather condition while high humidity and rainy conditions can cake the fertilizer in dry fertilizer boxes

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5. For more precise placement of fertilizers, liquid fertilizers are used, dry fertilizers are fit best where precise placement isn't necessary.
6. Through liquid fertilizes there is no yield drag as higher amount of nutrients are taken up by crops from liquid starter, while there might be some yield drag as dry starter may not uniformly distributed to crop.

Hence,

For greatest fertilizer nutrient use efficiency it is important to Select the right source, the right timing, the right rate and the right method of application, it can be achieved by developing a mechanism which will place the seed in soil and also precisely apply fertilizer in liquid form at root zone of crop at required rate and discharge.

David Calcino, 2013, stated that, we can use one-third less fertilizer when using liquids, as placement is better we don't need to use as much.

Alley Mark, 2010, studied the effect of pop up or starter fertilizer for corn in this it is stated that, In early season planting of corn when planted in cool soils, early root growth is slow, hence nutrient uptake during early growth stage can be low due to the small root system and cold soil temperature which limits root exploration. Hence the starter fertilizer address this issue of early season nutrient availability to plant by placing fertilizers in the soil near or with the seed.

Alley Mark, 2010, also stated that, Pop up or starter fertilizers are beneficial to increase the early season corn seedling growth with small amount of fertilizer.

Forsynth, 2010 studied the apparatus and method to improve field application of anhydrous ammonia in cold temperature. In this it is stated that the air compressor injects compressed air into the tank to maintain head pressure within the tank at between 80-150 psi facilitate flow of liquid NH3 from the tank to applicator, when the level of liquid NH3 present in the tank declines.

Agroculture liquid fertilizer company, 2007 carried out the study on planter fertilizer rate placement comparison for corn. In this experiment they have studied the effect of fertilizer on crop at different doses and at different places.

Agroculture liquid fertilizer company, 2007 also concluded that, for higher rate fertilizer application it is better to place it at 2X2 position and for low rate 0X0 position

Toler J. E., 2004 Studied the effect of starter fertilizer on cotton development. In this experiment he studied the effect of starter fertilizer placement at 5X5 on crop growth parameters at different time interval.

Dey, 2003, fabricated a single tyne, bullock drawn gravity flow aqua ferti seed drill for rainfed farming at Water Technology Center of Indian Agriculture Research Institute. The experimental results showed that for all the crops (wheat, mustard and gram) the use of AFSD increased the yield.

Edward Deibert, 2000 studied the fertilizer application with small grain seed at planting. In this he stated that, the single disc, double disc, offset double disc can be used for opening the furrow and placing the seed and fertilizer so that it progressively disturb more soil at the time of sowing, the more soil disturbance higher the rate of fertilizer that can be safely applied with seed because more soil mixing occurs and less fertilizer remains in direct contact with seed.

Singh and Yadav, 1985, recorded significant increase in number of pods per plant, grains per pod and grain yield per plant as well as per hectare for chickpea by liquid fertilizer application.

Singh and Singh, 1982, conducted experiments on wheat and paddy crop using a nitrogenous liquid fertilizer "Ankur" in different parts of Punjab. The study included performance evaluation vis-à-vis other solid fertilizers. It was concluded that the adoption of liquid fertilizer is limited due to absence of any proven technique for its application. It was suggested that the development of applicator is essential for promoting use of liquid fertilizer.

Minhas, 1982, carried experiments on wheat crop using a liquid fertilizer "Ankur" in the Solan district of Himachal Pradesh. The results indicated that the liquid fertilizer has a potential for increasing grain yield but the application technology is costlier than those used for solid nitrogen fertilizer.

James Wilkinson, 1977 stated that, when water soluble 'N' fertilizer is used, liquid applications may give a slightly quicker response and dry material may give slightly longer residues. He also stated that, during hot weather dry applications are also less likely to cause burn.

Guelle, 1954, stressed on the qualities of the fertilizer application machinery. It was suggested that liquid fertilizer application machinery should have a longer life, more accurate metering system and should accurately place fertilizer in relation to both seed and growing plants in order to obtain, maximum return. It was also suggested that the machine should reduce the cost of application. It was indicated that the main problem with the fertilizer application machinery is

the problem of corrosion due to which the life of the machine is shortened and accuracy become less. It was recommended that the use of stainless steel, fibre glass, cadmium or chrome plated copper as material for the fertilizer distribution system.

Tidejens, 1941, reported that fertilizer was readily available to the plants when applied in the liquid form. It was observed during the experiment that phosphate is greatly available when applied in the liquid form. It was noted that there was no danger of burning of plants, as the concentration of the fertilizer is low when applied in the liquid form. The gasoline barrels with pipes mounted on cultivators were used as a device for the application of liquid fertilizer.

After studying above all reviews it can be concluded that, a planter or any sowing machine can be attached with liquid fertilizer application system, which can apply liquid fertilizer at requisite pressure and application rate, at the time of sowing on the side of seed so that it can directly affect the plant growth as well it will minimize the quantity of fertilizer by 30 %. Further study can be done in the laboratory to optimize the combine effect of pressure, application rate and tractor speed in laboratory. The optimized combination of pressure, application rate and tractor combination is then can be taken to experimental field in order to check the effect of liquid fertilizer at different placement position on crop growth parameters.

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