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Review on the effect of nitrogen and phosphorus fertilizer rates on seed yield of onion (*Allium cepa* L.)

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Abstract

Onion is an herbaceous biennial monocot cultivated as an annual. In most research the greater seed yield in onion cultivars used to be due to the higher range of seed stalks per plant and to a wider umbel diameter which had been influenced through utility of Nitrogen and Phosphorus fertilizers. The wide variety of flower opening on every day was influenced by using the range of hours of sunshine and attention of phosphorous and nitrogen. Nitrogen and Phosphorus remedies tended to decrease bolting percentages. The yield of seed per plant extended as the nitrogen in the nutrient answer improved where seed stalks had been produced. The impact of early dressings of N on crops grown underneath stipulations when nights are turning into cooler is shown to permit the plants to reach a 'bolting inducible' stage early in the growing season. The early flowering via the application of P fertilizer used to be due to fact that phosphorus involvement in metabolic and physiological activities. The best possible costs of Phosphorus 115 and 147 kg_{ha}⁻¹ gives well boom and yield. There is most response of onions to Phosphorus fertilization in the range 0-52 kg ha⁻¹. Nitrogen fertilizer utility improves phosphorus uptake from the soil. Too lots phosphorus level influences plant boom by using suppressing the uptake of iron, potassium and Zink.

Keywords: fertilizer, nitrogen, onion, phosphorus, yield

Introduction

In latest estimations there are about 750 species in the genus *Allium*, amongst which onion, Japanese bunching onion, leeks and garlic are the most necessary fit for human consumption *Allium* vegetation (Rabinowitch and Currah, 2002) ^[30].

Onion is an herbaceous biennial monocot cultivated as an annual. Onion is used specially as flavoring dealers and its one-of-a-kind pungency which is due to the presence of a unstable oil (allyl propyl disulphide). The mature bulb consists of some starch, considerable quantities of sugars, some protein, and vitamins A, B, and C (Decoteau, 2010) ^[11]. *Allium* and its close household are identified as wonderful family, the Alliaceae. The estimated complete area beneath onion manufacturing in Ethiopia is about 13,000 hectares from which 163,800 tones were produced in 2004 E.C with average yield of about 12.9 t / ha (<http://www.fao.org>).

Onion seeds are well known to be noticeably perishable and poor in retaining nice and lose viability inside a year. One of the issues of onion production in the tropics is lack of seed which is true to type and of high germination and power (Currah and Proctor, 2013). There are two onion seed manufacturing methods, the seed-to-seed and bulb-to-seed methods. The latter technique allows rouging and selection to include mature bulb morphology and is in particular important for primary seed production. The first, as an annual technique takes less than a year and doesn't contain lifting and storing the bulbs (Brewster, 2009; George, 2012) ^[7]. Enormous differences in common seed yields are observed relying on genotype, locality, season, soil type and method of seed production (Brewster, 1994). The pricey bulb to seed approach is normally used for seed production. Bulbs of medium measurement classes (4-5 cm diameter) are advocated for seed production (Yohanes, 2007). The seed furnish from the home production is no longer as required and vegetable growers rely basically on imported seeds that have frequently poor germination and uniformity and prone to illnesses (Lemma, 2008).

There are quite a number production constraints of onion seed amongst which is lack of excellent quantity of fertilizers beneath local condition. Fertilizer practices for the onion seed crop range widely. Fertilizer recommendations, derived from experimental work by means

of Nandpuri *et al.*, (2014) ^[24] are to apply sixty two kg P/ha and 50 kg K/ha before planting and 125 kg N/ha cut up into two doses, 1/2 to be given two weeks after planting the mom bulbs, when the shoots are appearing, and half of 45-60 days later. In Ethiopia 90-135 kg P₂O₅/ha and 81-144 kg N/ha urea is used for bulb manufacturing in sandy loam soil whilst ninety two kg N/ha is used for seed production (Lemma and Shimeles, 2003; Dawit. *et al.*, 2004) ^[22, 10].

A excellent furnish of nitrogen stimulates root growth and improvement as nicely as the uptake of other vitamins (Brady and Weil, 2002). Plants respond rapidly to improved availability of nitrogen, their leaves turning deep green in color. Nitrogen will increase the plumpness of cereal grains, the protein content of both seeds and foliage, and the succulence of such plants as lettuce and radishes. It can dramatically stimulate plant productiveness (Sopher and Baird, 2005) ^[32]. Neither plant life nor can animals develop except phosphorus. It is an critical element of the organic compound regularly referred to as the strength currency of the living cell: adenosine triphosphate (ATP). Synthesized thru both respiration and Photosynthesis, ATP consists of a high-energy phosphate group that drives most energy-requiring biochemical processes. For example, the uptake of nutrients and their transport within the plant, as nicely as their assimilation into exclusive bio-molecules are energy-using plant procedures that require ATP as cited by using (Sopher and Baird, 2005) ^[32].

Phosphorus is an essential factor of deoxyribonucleic acid (DNA), the seat of genetic inheritance, and of ribonucleic acid (RNA), which directs protein synthesis in each plant life and animals. Phospholipids, which play crucial roles in cell membranes, are some other classification of universally vital phosphorus-containing compound. For most plant species, the total phosphorus content material of healthy leaf tissue is not high, usually comprising solely 0.2 and 0.4% of the dry count (Brady and Weil, 2002).

Objectives

To assessment the results of Nitrogen fertilizer prices on seed yield of onion.

To evaluation the effects of Phosphorus fertilizer charges on seed yield of onion.

To overview the interaction effects of Nitrogen and Phosphorus fertilizer costs on seed yield of onion.

Literature Review

Effect of Nitrogen on Seed Yield of Onion

Increasing application costs of N fertilizer improved the seed yield per plant (Cuocolo and Berbieri (1988) said that seed yield extended linearly from 830 to 1100 kg/ha with growing N at the fee of zero to a hundred and fifty kg/ha in 30 kg/ha increments Nwadukwe and Chude (1995) ^[25] have reported that N rate at 50 or one hundred kg/ha with P at 50 kg/ha expanded seed yield from 184kg/ha to 226 kg/ha compared to the control remedy Bulbing, flowering and seed production of onion are controlled via climatic circumstance such as temperature and photoperiod and seed manufacturing is more annoying than bulb manufacturing (Rabinowitch, 1990) ^[29].

Temperature appreciably influences the flowering of onion. Cool temperature with enough water furnish is most appropriate for formerly boom accompanied through warm, drier circumstance for maturation. Low temperature (9-17 °C) is required for flower stalk improvement (Singh, 2001).

Effect of Phosphorus on Seed Yield of Onion

The impact of phosphorus utility in increasing bulb yield and its traits could be explained via the role of phosphorus (Singh *et al.*, 2000). Shaheen *et al.* (2007), reported that the absolute best application of phosphorus (92kg/ha phosphorus) fertilizer had a major effect on the productiveness of onion plant, hence increased total bulb yield and its components. Application of phosphorus level positively increase and extensively affect bulb length, bulb diameter, average bulb weight, bulb dry remember content, marketable yield and total bulb yield .The best possible rates of Phosphorus one hundred fifteen and 147 kg•ha⁻¹ offers better increase and yield (Singh and Singh, 2000).

Growers on the southeast Georgia use a large quantity of Phosphorus fertilizer as high as 89 kg.ha⁻¹ primarily based on a fashionable fertilizer program. Significant quantities of Phosphorus fertilizer, specially (NH₄)₂H₂PO₄, typically appear greener with large tops. High Phosphorus fertilizer may additionally be warranted when onion tops are damaged such as at some point of hailstorms, these onions may additionally additionally advantage from excessive Phosphorus fertilizer in which large inexperienced tops are essential (Boyhan *et al.*2001). The superior of Phosphorus utility in growing the tonnage bulbs yield and its physical residences may want to be explain through the position of phosphorus which is extraordinarily important as a structural phase of many components, rather nucleic acid and phospholipids. In addition, phosphorus has an necessary function in energy excessive energy of hydrolysis of phosphate and a number organic phosphate bonds being used to induce chemical response (Shaheen *et al.*, 2007). There is most response of onions to Phosphorus fertilization in the range 0-52 kg ha⁻¹. Depending on yield levels, Phosphorus uptake quotes in onion are estimated to be about 15-30 kg ha⁻¹. Depending on soil Phosphorus status, cultivar and plant density, phosphorus software prices of up to 200 kg ha⁻¹ had been determined to maximize onion yields and bulb weights (Vachhani, Patel, 2003) and limit storage loss of bulbs (Singh *et al.*, 2000). Increased Phosphorus degrees are additionally acknowledged to enhance bulb measurement and the quantity of marketable bulbs in onion. Regardless of the Phosphorus repute of the soil, placement of Phosphorus fertilizers in the soil close to the plant would be the most high quality method of Phosphorus furnish to onion plants (Brewster, 2009) ^[7]

Effect of Nitrogen and Phosphorus on Flower Development and Seed Formation

Phosphorus is one of the cell macro elements which do plenty of matters for plants. One of the most essential components of phosphorus is its resource in root growth and influences the vigorosity of the plant and it is one of the most necessary elements in growth, flowering as well as closing seed yield of plant. It is the primary essential nutrient in the flowers reproductive stages (Sidhu *et al.* 1996) found that stalk heights for different cultivar of onion in the range of 76-93 cm, this increment of height by means of applied N in section may want to be due to main factor of N contributing to the greater fees of vegetative growth and stem elongation when excessive doses of nitrogen fertilizers are applied to the vegetation (Marschner, 1995; Gupta and Sharma, 2000) ^[15].

Patil *et al.* (2003) recorded that days to flowering ranging from 82.5-88.3 days below exceptional moisture regimes.

The early flowering of onion with the aid of the software of P fertilizer ought to be due to fact that phosphorus involvement in metabolic and physiological activities i.e., an expand in the release of P from vacuoles can provoke the respiratory burst which correlated with fruit ripening (Pandita and Andrew, 1967).

Effect of Fertilization on Onion Seed Production

According to Ahmed, 2009 stated that fertilizer N, P and K affect bolting and the yield and fantastic of onion seed. Nitrogen and Phosphorus redress tended to decrease bolting percentages, whilst application of K tended to inspire bolting (7-23 percent increases) of onion cultivar Nasi grown on heavy clay soil in Sudan. However, other work via Hassan (2011) [16], which blanketed irrigation timing and nitrogen as the factors studied, point out that both bolting and doubling had been expanded N Level On the contrary, effect of N vitamin on the quantity of inflorescences per plant and their improvement did now not show any significant response on bolting however below low temperature induction, floral bud formation used to be improved through low N stages as compared with high N regime (Rabinowitch and Brewster, 1990) [29]. In Maryland, the usage of yellow Bermuda 986' in inexperienced house, confirmed that the plant which have been given little or no nitrogen have been small and seldom divided to shape extra than one seed-stalk, however they bolted uniformly. Plants on high nitrogen, however, have been strongly vegetative and regularly bulbed as an alternative of bolting. He further indicated that the yield of seed per plant multiplied as the nitrogen in the nutrient answer multiplied where seed stalks were produced. According to Ahmed (1982) fertilizer N, P and K have an effect on the yield and first-class of onion seed product. How other research showed that greater degree of nitrogen increased seed yield but at the expense of seed quality. High K ranges in the course of bulb production were carried over to the 2nd year and additionally better seed quality. Fertilizer trial on onion in a semiarid tropical soil of Nigeria confirmed that Nitrogen and Phosphorus and their interplay expanded wide variety of umbels per original bulb, seed weight per umbel and seed yield. At 50 kg P ha⁻¹, the utility of 50 or 100 kg N ha⁻¹ gave drastically higher seed yield than different Nitrogen and Phosphorus rate combinations tested (Nwadukwe and Chude, 1995) [25]. Application of each P and K collectively with N, did not have an effect on the range of inflorescences formed. However, applications of both P or K significantly enhance bolting (Rabinowitch and Brewster, 1990) [29].

Interaction consequences of Nitrogen and Phosphorus fees on Onion Seed Production

As noted by using Prats *et al.* (1996) [28] and Sidhu *et al.* (1996), umbel diameter used to be foremost identifying element for seed yield. Prats *et al.* (1996) [28] and Sidhu *et al.* (1996) indicated that the greater seed yield in onion cultivars was due to the greater variety of seed stalks per plant and to a wider umbel diameter which had been influenced with the aid of application of Nitrogen and Phosphorus fertilizers. Shemelis (2000) in his study of flower and seed manufacturing plausible of onions in Melkasa, discovered that Adama Red was once bolted within 24.7 days. Nitrogen has physiological features in plant which enlarge the plumpness and succulence of vegetation thereby encourages the vegetative boom rather

than structure improvement. The duration of flowering used to be expected to be affected by means of the growing circumstance (Globerson *et al.*, 1981) [14].

Patil *et al.* (2003) recorded days to flowering ranging from 82.5-88.3 days below specific moisture regimes. The early flowering by means of the software of P fertilizer was once due to truth that phosphorus involvement in metabolic and physiological things to do i.e., an increase in the launch of P from vacuoles can initiate the respiratory burst which correlated with fruit ripening. The delay in maturity due to N fertilizer software may want to be per chance due to the truth that this factor influences the supply of carbohydrate all through the vital period of reproductive phase through its impact on the reduction of sugar concentration in the leaves all through the early ripening stage and inhibition of the translocation of assimilated merchandise (Marschner, 1995).

Summary and Conclusion

Onion is grouped under the household of alliaceae. Onion seeds are well recognized to be fantastically perishable and terrible in retaining first-rate and lose viability within a year. One of the issues of onion manufacturing is the unsuitable application of N and P utility for the proper to type and of high germination and power. Fertilizer practices for the onion seed crop fluctuate widely. There are two onion seed production methods, the seed-to-seed and bulb-to-seed methods. A top supply of nitrogen stimulates root increase and improvement as nicely as the uptake of other vitamins. Plants responds rapidly to elevated availability of nitrogen, their leaves turning deep inexperienced in color. Root growth, especially development of lateral roots and fibrous rootlets, is motivated by way of phosphorus. Fertilizer N, P and K have an effect on bolting and the yield and first-rate of onion seed. Plants on excessive nitrogen, however, have been strongly vegetative and regularly bulbed as an alternative of bolting. Nitrogen and Phosphorus one after the other or in aggregate proved to have no impact on the range of branches or flower stalks produced per plant. High bolting levels in plant raised from seed have additionally been reported to result from the usage of low degree of N. The nutrients absorbed from the soil ought to have diverted and sink into vegetative components for photosynthesis and resulted in plants will quit up with a luxurious foliage growth. The extend in maturity due to N fertilizer software should be maybe due to the truth that this thing affects the supply of carbohydrate all through the quintessential duration of reproductive phase. Increasing utility charges of N fertilizer extended the seed yield per plant. Plant roots take up nitrogen from the soil solution principally as nitrates (NO₃⁻) and NH₄⁺ ions.

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