

could be potential source of maintaining/restoring soil fertility. Bensulf zinc plus SUPERFAST is having elemental S (90% S) and Zn. It may improve growth and development of onion plants. Hence, field experiment was conducted with 17 treatments to study the effect of Bensulf SUPERFAST and Bensulf zinc plus SUPERFAST on plant growth, yield and quality. Desired total plant population was maintained in all the sulphur treatments. The results showed that application of S through Bensulf Superfast or Bensulf zinc plus SUPERFAST @ 40 kg/ha along with recommended NPK increased plant height, onion yield, and sulphur concentrations in comparison to the control without sulphur. Moreover, plant height, onion yield, and sulphur concentrations produced with application of S through Bensulf Superfast or Bensulf zinc plus SUPERFAST @ 40 kg/ha along with recommended NPK were statistically at par with 20:20:00:13 source @ 40 kg/ha and ammonium sulphate @ 40 kg/ha. However, sulphur application through different sources did not affect soil pH, calcium carbonate and soil fertility status, and total storage losses significantly.

Keywords: Bensulf Superfast, Sulphur, Zinc, onion

TI-OP4

Growth and Total Factor Productivity Change of Garlic in Gujarat: A Sustainable Way to Increase Production

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This paper has analyzed the growth in Total Factor Productivity (TFP) of garlic crop and temporal change in economic aspect in Gujarat state from 1995-96 to 2015-16. The Tornqvist Theil Index has been used to calculate the total output index, total input index and TFP index. Two outputs and ten inputs have been used to construct output and input indices. The results revealed that during 1995-96 to 2016-17 the area, production and productivity of garlic crop in Gujarat were remain stagnant at the rate of 0.63, 1.61 and 0.98 per cent per annum. It has also registered that garlic experienced moderate growth rate of TFP (1-2%) of technological change in Gujarat state, which is a healthy augury. It is good for agricultural production of the state crop sector. It was observed that the rate of output indices and TFP indices about 1.71 and 1.37 per cent per annum during 1994-95 to 2015-16. The growth in TFP remained low about 0.04 per cent per annum during 1995-

96 to 2004-05, this improved considerably about 1.79 per cent per annum during 2004-05 to 2015-16. This reveals that the technological change was occurring in garlic crop during the last decade. The achievement of good growth of TFP for garlic crop in Gujarat during last decade due to the release of improved varieties viz. Gujarat Garlic-3 in 1999, Gujarat Garlic-4 in 2007 and Gujarat Garlic-5 in 2014 by the then GAU's and SAU's in the state, which remarkably increased the productivity of garlic crop. The increased in irrigation facilities also contributed for the same. This has largely help to reduce the cost of cultivation, although the input prices including Labour charges increased remarkably during recent year. Similar results were also reported by Gami and Dhandhalya (2013) that the output, input and TFP indices of cumin were increased at the rate of 2.31, 0.66 and 1.64 per cent per annum during 1990-91 to 2011-12. It essential that growth in TFP needs to be sustained and further improvement, through varietal improvements, irrigation developments and adopting proper agronomical practices.

Keywords: Garlic, TFP growth, research, investment, return, Gujarat, *etc.*

T1-OP5

Investigating the Impact of Massing Cages with Variable Dimensions on Bulb-to-Seed Production in Onion

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Onion, a crucial vegetable crop in India, is cultivated throughout the country in various seasons, including *kharif*, late *kharif* and *rabi*. While onion production primarily relies on seed propagation, challenges such as short-day length conditions, sub-optimal cultivation standards, weather uncertainties and the use of local low-yielding varieties hinder seed yield. Quality seed availability emerges as a key constraint, impacting productivity. This study aims to enhance onion seed production by addressing these challenges. Traditional onion seed production methods, such as bulb to seed and seed to seed, are commonly employed. However, the seed-to-seed methods is less preferred due to limitations in examining true-to-type bulbs and the rouging of off-types, diseased and multicentre bulbs. Bulb to seed method, the primary method, involves harvesting mature bulbs in the first season. Medium-sized bulbs (50-80 g) are carefully selected and stored for subsequent seed production, subject to optimal temperature conditions. This research further explores the intricacies of onion bulb-to-seed production, with a focus on the influence of massing