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RESEARCH ARTICLE

ENHANCING THE YIELD AND QUALITY OF OILSEED CROPS IN NEPAL THROUGH APPLICATION OF SULPHUR FERTILIZERS

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ABSTRACT

Sulphur is a dynamic source to produce quality seed having higher marketable value. It is an important constituent of plant protein i.e. cysteine, cystine and methionine for the growth and development of quality seed. Real-time application of recommended dose of Sulphur fertilizer during the grain filling stage revealed higher crop yield with seed containing Sinigrin, Gluconapin, and progoitrin protein as indicator of greater quality seed. Adequate application of Sulphur facilitates the nitrogenous component to metabolites into nitrate easily which, promotes the chlorophyll present in the leaf, plant height, dry matter, leaf per plant, greater seed weight and mostly important the flavor in seed. However, the lack of knowledge about the importance of Sulphur fertilizers among the smallholder farmers in Nepal, productivity and marketable quality of the oil seed crop were decreasing. Weak communication of farmer among the knowledge provider and input suppliers revealing the crop into starving soil, remoting traditional acknowledge with better farming for greater yield. Without ensuring the quality of the crop, farmers were applying greater amount of chemical fertilizer for promising higher amount of crop yield. farmers were more oriented toward profit rather than quality.

KEYWORDS

Sulphur, Cysteine and methionine, quality, soil fertility, crop yield.

1. INTRODUCTION

Oil seed crops are those crops which are grown for edible oil and oil derivatives. Commonly grown oilseed crop in Nepal are mustard, rapeseed, sesamum, linseed, soybean and sunflower. In 2015/16 the area of cultivation of oilseed crops in Nepal was 217,867 hectares, with a production of 208,291 tons and the yield of 956 kg per hectare. The rapeseed (Brassica campestris var. toria) is dominant (85%) varieties among the other promising oilseed crops in Nepalese cultivated land [1]. Rice-mustard cropping pattern is most important cropping pattern found in Terai and inner Terai region of Nepal and mustard is an important emerging oilseed crop of Nepal. Sequential cropping pattern of Rice-Mustard farming through integrated management in Terai Nepal for the sustainable production throughout the year. Mustard is also grown as intercrop or mixed crop with lentil, chickpea and linseed [2]. Oil seed crops play a vital role in ameliorating food security of Nepal however, they are not prioritized as like food crops. Oilseed crop has great potential for reducing the contracted economy of country.

Farmers were cultivating rapeseed and mustard crop under energy starvation condition to cover the fallow land which has resulted in their continuous decreased productivity. Oilseed were not cultivated in large scale as like of cereal crops which has attributed for high oil demand in Nepal and it is being imported from neighboring country. The main reasons behind decreased yield and quality of oilseed crop like rapeseed are improper fertilization, micronutrient deficiencies, poor plant population and decreased seed yield of mustard in Terai region is due to lack of suitable cropping system [3]. Sulphur availability for profitable crop production is continuously declining [4]. It is reported that farmers don't apply Sulphur fertilizers as popular fertilizer like N,P,K which, caused in the expansion of Sulphur deficient area. Rapeseed and mustard have the highest requirement of sulphur among all oilseed crops [5]. Sulphur nutrient deficiency in soil is reported throughout the world whereas, Sulphur deficiency in crop soil has been reported as a major constraint in the agriculture throughout the world [6]. Decline in application of sulphur fertilizer has resulted in Sulphur deficiency in soil, leading to reduction crop yield and quality [7].This review is written by compiling different scientific literatures so that it can be a useful information for students, researchers and other agricultural enthusiasts who are working for increasing productivity and quality of oil seed crops in Nepal.

1.1 Agro-climatic condition for the growing oilseed crop in Nepal

Oilseed crop favors the cool and dry weather of winter season in Terai and hilly region of Nepal. Mild and timely rainfall during the growing season promote physiological growth and yield of crop. During the cropping season humidity should be greater than 90 percent to facilitate morphological, physiological and phenological trait. Cropping the oilseed crop after the rice plantation creates a favorable microclimatic environment. Soil rich in organic matter, optimum moisture regime, and having neutral Ph favors for the oilseed crop cultivation. Oilseed crop thrive best on the sandy loam to clay loam soil whereas, it does not tolerate the waterlogging condition or heavy soil properties.

2. RESULT AND DISCUSSION

2.1 Yield parameter

Productivity of Indian mustard was increased with application of Sulphur at 45 kg per hectare with coupling of irrigation twice at 30 DAS and 60 DAS [8]. It was revealed from the experiment that there was increased average yield of rapeseed when medium dose of S (40 kg s/ ha) was applied in combination with nitrogen (160 kg/ha) but, when the higher dose of S (65 kg s/ ha) was applied along with the nitrogen (160 kg/ha) fertilizer privilege with reduce average yield [9]. The yield attributing characters of mustard were increased when NPK was applied at the rate of 120:60:40 kg /ha + 40 kg Sulphur /ha [10]. Sulphur application in mustard enhanced plant height, leaf per plant, dry matter accumulation, crop yield, and seed quality [11]. The experimental evidence shows that, the basal application of sulphur (40 kg S/ha) as a Polysulphate had a significant effect on grain yield of mustard and sesame up to about 33% more as compared to control [12]. The productivity of rapeseed was maximum when sulphur was used at a dosage of 60 kg s/ha which was about 24 % higher than control condition [13]. It is argued that, application of recommended dose of

sulphur fertilizer as per crop requirement in the cultivated soil as a basal dosage will promising to achieve high yield. The application of 40 kg of Sulphur /ha in combination with spray of 1 ppm boron and recommended doses of NPK should be applied under rainfed condition for higher seed yield of mustard crop [14]. It was reported from the experiment that sulphur and phosphorus increased the yield of Indian mustard to some extent under salinity condition but, they restored the yield attributes of Indian mustard under such salt stress [15]. It was revealed that the yield of mustard was significantly increased by 14.50 % in comparison to control when 60 kg /ha of zypmite was used [16]. The Yield attributing characters such as number of siliqua /plant and number of seeds/siliqua and yield (seed and Stover) were significantly increased with increasing dosage of Sulphur up to 40 kg /ha. The foliar spray of ammonium sulphate as 1 % Sulphur improved the phenological traits of Canola [17]. The productivity of mustard was increased with successive addition of sulphur up to 45 kg/ha irrespective of sources such as SSP, Gypsum and Elemental Sulphur [18].

2.2 Oil content and quality

Sulphur nutrition is a major constituent for the quality of oilseed crops. however, the reduced application of sulphur in oilseed crops has resulted in decreased seed quality. The required application of Sulphur to rapeseed and mustard increases the content of glucosides, glucosinolate and protein. It was reported from the experiment that application of Sulphur at a dose of 60 kg s/ha, significantly affected on the content of glucosinolate and oil [19]. Whereas, similar report was founded by Walker and Booth (1994) that application of sulphur fertilizer ameliorate glucosinolate content in mustard seed [20]. The frequently irrigation in the field of oilseed crop proliferate the oil content significantly along with the application of Sulphur at 45 kg s/ha. From the experiment revealed, oil content was highest (44.62%) in Mustard with sulphur application at dosage of 60 kg s/ha. Oilseed crop were more sensitive to specific nutrient and irrigation application at the stage of grain filling to ameliorate derivatives of oil constituents. For assuring the flavor imparting components in oil, application of sulphur is essential assist for quality of oil. The increasing levels of sulphur fertilizer from 0 to 60 kg s/ha increased allyl isothiocyanate content in mustard seeds [21].

3. CONCLUSION

Nutrient-philic oilseed crops were cultivated in Nepal under the nutrient starved agricultural land with an expect of greater crop yield. Farmers were encouraged to apply Sulphur fertilizer as an essential nutrient for better seed quality with higher yield. Economically driven farmer approaches on cultivation for greater productivity without addressing the quality and fertility of the soil. These oilseed crops are high Sulphur demanding crops, but they are cultivated in Nepal in minimal or even in the absence of Sulphur fertilizers which has alleviated the yield and quality. To assure higher yields, Sulphur should be applied based on the dual criteria which are requirement of crop and available of Sulphur in soil. There were contributing data and information for growing the oilseed crop commercially, without losing the seed quality in Nepalese agriculture land after the rice farming. The contracted economic status of the country can be broadened by intensive cultivation of oilseed crop through proper application of fertilizer. This review serves as a useful content to researchers, soil scientist and nutritionist who are working in food and nutritional security in Nepal.

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