STUDY OF FOLIAR NUTRITION APPLIED AT DIFFERENT GROWTH STAGES ON NIGER (*Guizotia abyssinica* L.)

ABSTRACT

A field experiment was conducted during *Rabi* season of 2021-22 at Niger Research Station, NAU, Vanarasi, Gujarat to study the effect of foliar spray of nutrients applied at different growth stages on *rabi* niger (*Guizotia abyssinica* L.). The experiment was laid out in randomized block design with three replications. The treatments consisted of seven treatments including foliar spray of 19:19:19 and Novel organic liquid (A Patented NAU product) applied at different growth stages on niger crop. The experimental results revealed that foliar application 1% 19:19:19 applied at flowering and capitula formation stage recorded significantly higher number of branches per plant. The number of seeds per capitulum and seed yield also remained significantly higher with the application 1% 19:19:19 applied at flowering and capitula formation stage which was found at par with treatment receiving foliar spray of 1% 19:19:19 at flowering stage and foliar spray of 1 % novel organic liquid at flowering stage.

Keywords: Niger crop, Foliar spray, 19:19:19, Novel organic liquid

1. INTRODUCTION

Oilseeds occupy a key place in agricultural economy of India, constituting an important group of crops next to cereals. Niger (*Guizotia abyssinica* L.) is believed to have originated from Ethiopia where it was domesticated from about 2000 BCE, and then spread to India. In India, Niger is grown on an area of 2.61 lakh ha mainly during *kharif*. Andhra Pradesh, Assam, Chhattisgarh, Gujarat, Jharkhand, Karnataka, Madhya Pradesh, Maharashtra, Odisha and West Bengal are the other states where niger is grown. The average yield in India is 3.21 q/ ha. Niger seeds contains edible oil (38 to 43%), protein (18 to 24%), sugar (12%) and minerals essential for human and animal meals. The main aim of foliar fertilization is to eliminate “hidden hunger”, which is a very important consideration in high-input production systems and during critical stages of growth when roots are unable to assimilate the required amounts of nutrients, even in fertile soils. One of the best foliar fertilizers 19:19:19 for crop like pulses, vegetables, paddy for green house cultivation, nurseries, kitchen garden and for all types of field crop. The use of 19:19:19 resulted in cost saving and at the same time significantly increases the yield. Economic benefit ultimately matters for farmers and novel organic liquid nutrient plays an important role to improved it, (Singhal *et al.,* 2015). Novel organic liquid nutrient is a product of Navsari Agricultural University, Navsari, Gujarat which was patented in the year of 2012. Since foliar nutrient usually

penetrate the leaf cuticle or stomata and enter the cell facilitating easy and rapid utilization of nutrients, so foliar nutrition on niger helps in achieving the optimum grain yield of niger.

2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY

The field experiment entitled effect of foliar nutrition applied at different growth stages on *rabi* niger (*Guizotia abyssinica* L.) was conducted during *Rabi* season under irrigated condition of the year 2021-22 at Niger Research Station, Navsari Agricultural University, Vanarasi. The soil of the experimental field was black color and clayey in texture with medium in available nitrogen, low in available phosphorus and high in available potassium and moderately alkaline in reaction. The experiment was laid out in randomized block design with three replications. The treatments consisted of seven level of foliar nutrition applied at different growth stages of niger crop *viz.,* F_1: foliar spray of water (Control), F_2:1% 19:19:19 at flowering stage, F_3:1% 19:19:19 at capitula formation stage, F_4:1% 19:19:19 at flowering and capitula formation stage, F_5:1% Novel organic liquid at flowering stage, F_6:1% Novel organic liquid at capitula formation stage, F_7:1% Novel organic liquid at flowering and capitula formation stage. The niger cultivar GNNIG-3 was fertilized with recommended dose 20 kg N and 20 kg P_2O_5. At the time of sowing Nitrogen was supplied through urea while phosphorus supplied through single super phosphate.

3. RESULTS AND DISCUSSION

3.1 Growth parameters in niger as influenced by foliar nutrition applied at different growth stages

Data presented in Table 1 indicated that plant height at 60 DAS it was recorded higher with foliar spray of 1% 19:19:19 at flowering stage (F_2) (51.07cm). Although plant height did not differ statistically, but numerical values showed higher plant height in all the foliar nutrition treatments at harvest stage compared to control (F_1). Foliar spray of 1% 19:19:19 at flowering and capitula formation stage (F_4) showed significantly higher number of branches per plant at harvest stage (6.13) across all the treatments. Treatment F_4 was found at par with treatment 1 % 19:19:19 at flowering stage (F_2) and treatment 1% novel organic liquid at flowering stage (F_5).

It might be due to hastening various metabolic process *viz.,* photosynthesis, symbiotic biological N_2 fixation process due to nutrient availability at the initial stage of the crop. Further, phosphorus present in 19:19:19 fertilizer absorbed directly by the plant might have increased cell division and cell development leading to more number of branches. Similar results were obtained by Shwetha *et al.* (2018) in groundnut crop Banasode and Math (2018); Basu *et al*. (2019) in Sesamum crop and Deshmukh *et al.* (2023) in soybean.

3.2 Yield attributes and economics in niger as influenced by foliar nutrition applied at different growth stages

Yield attributes

The Study revealed that significantly higher number of seeds per capitulum (27.76) was recorded with foliar spray of 1% 19:19:19 at flowering and capitula formation stage (F_4) and was found at par with rest of foliar nutrition treatments except 1% novel organic liquid at capitula formation stage (F_6) and foliar spray of water (control) (F_1). The lowest number of

seeds per capitula (20.03) were recorded with foliar spray of water (control) (F_1). significantly higher seed yield (514kg/ha) was recorded with foliar spray of 1% 19:19:19 at flowering and capitula formation stage (F_4) and was found at par with 1% 19:19:19 at flowering stage (F_2), 1% Novel organic liquid at flowering and capitula formation stage (F_7) and 1% Novel organic liquid at flowering stage (F_5). While, significantly the lower seed yield (379kg/ha) was recorded with foliar spray of water (F_1). The increase in yield due to foliar nutrition treatment in F_4, F_2, F_7 and F_5 as compared to control (F_1) was 35%, 27%, 23% and 21%, respectively.

It might be due to the foliar spray of 19:19:19 that increased number of branches, capitula per plant and seeds per capitulum which directly related to seed yield per plant and production per unit area. Further, foliar spray may have increased the photosynthetic activity and delays the senescence of leaves, which enhance the supply of photosynthate available for grain filling, resulting in more number of capitula per plant and ultimately seed yield. The results are in confirmation with finding of Sethi *et al.* (2021) in Indian mustard, Krishnaveni *et al*. (2021); Monika *et al. (*2021) and Sarika *et al.* (2022) in sesame crop; Bodke *et al*. (2022) and Deshmukh *et al.* (2023) in soybean crop. Novel organic liquid nutrients which provide nutrient supply as well as growth promoting hormones. Application of novel at early growth stages thus might have improved growth and development of the crop resembling in number of branches, capitula per plant and seeds per capitula, which is further reflected in increase of seed yield. Similar finding was reported by Singhal *et al.* (2015) and Champaneri *et al.* (2021).

Economics

The study revealed that maximum net return of ₹17676/ha with BCR of 1.96 were accrued with treatment 1% 19:19:19 at flowering and capitula formation stage (F_4) followed by foliar spray of 1% 19:19:19 at flowering stage (F_2) with net return of 16872 ₹/ha with BCR of 2.00 and 1% novel organic liquid at flowering stage (F_5) with net return of 15812 ₹/ha with BCR of 1.95, where as the lowest net return of ₹10602/ha were obtained with foliar spray of water (control) (F_1) with BCR 1.76.

Table 1: Study of growth parameters in niger as influenced byfoliar nutrition applied at different growth stages

Treatments	Plant height (cm)			Number of branches
	30 DAS	60 DAS	At harvest	
F_1: Foliar spray of water (control)	13.02	50.33	73.17	4.63
F_2:1% 19:19:19 at flowering stage	12.73	51.07	78.77	5.87
F_3:1% 19:19:19 at capitula formation stage	12.38	47.90	76.73	5.27
F_4:1% 19:19:19 at flowering and capitula formation stage	13.05	50.48	97.07	6.13

F_5:1% Novel organic liquid at flowering stage	13.40	50.89	79.20	5.93
F_6:1% Novel organic liquid at capitula formation stage	11.93	46.20	75.10	5.20
F_7:1% Novel organic liquid at flowering and capitula formation stage	12.98	50.20	78.93	5.80
SEm±	0.38	1.88	2.91	0.23
CD at 5%	NS	NS	NS	0.73
CV%	5.3	6.6	6.5	7.5

Table 2: Study of yield attributes and economics in niger as influenced byfoliar nutrition applied at different growth stages

Treatments	Number of seed per capitulum	Seed yield (kg/ha)	Net return (₹/ha)	B:C ratio
F_1: Foliar spray of water (control)	20.03	379	10602	1.76
F_2: 1% 19:19:19 at flowering stage	25.87	482	16872	2.00
F_3: 1% 19:19:19 at capitula formation stage	22.72	426	12956	1.86
F_4: 1% 19:19:19 at flowering and capitula formation stage	27.76	514	17676	1.96
F_5: 1% Novel organic liquid at flowering stage	25.13	462	15812	1.95
F_6: 1% Novel organic liquid at capitula formation stage	21.74	418	12732	1.87
F_7: 1% Novel organic liquid at flowering and capitula formation stage	25.65	468	15096	1.85
SEm±	1.05	24		
CD at 5%	3.25	74		
CV%	7.6	9.2		

4. CONCLUSION

On the basis of one year field experiment, it can be concluded that spraying of 1% 19:19:19 or 1% novel organic liquid at flowering stage may be done for getting profitable niger production.

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