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Effect of foliar application of nutrients on growth and yield of horse gram (*Macrotyloma uniflorum* (Lam.) Verdc.)

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Abstract
Present investigation entitled Effect of foliar application of nutrients on growth and yield of horse gram (*Macrotyloma uniflorum* (Lam.) Verdc.) was carried out during *kharif* season of 2020 at NARP, Dryland Sub Centre (Agroforestry), MPKV, Rahuri. Situated between $19^0$48' and $19^0$57' N latitude and $74^0$52' and $74^0$10' E longitude at 495 to 569 meters above mean sea level on red loamy soil with low in nitrogen and phosphorus and moderately high in potassium. Experimental result revealed that growth characters *viz.*, plant height, periodical number of functional leaves plant^{-1}, Leaf area plant^{-1}, Dry matter production plant^{-1}, yield contributing characters *viz.*, no. of pod plant^{-1}, no. of grains pod^{-1}, pod length (cm), diameter of pod (cm), 100 grain weight (g), grain yield plant^{-1} (g), grain yield (kg ha^{-1})and Straw yield (kg ha^{-1}) were significantly influenced by foliar application of water soluble fertilizer 19:19:19 (NPK) @ 2% at 35 & 45 DAS. On the other hand, in all cases the lower response was found from without application of foliar spay.

Keywords: Horse gram, foliar application, water soluble fertilizer 19:19:19 (NPK)

1. Introduction
Horse gram (*Macrotyloma uniflorum* (Lam.) Verdc.) is an important crop of south India. Its grain is used for human consumption as 'dal' as well as in preparation of so called 'rasam'. Horse gram is known as a poor man's pulse crop. The origin of horse gram is south west India. The name *Macrotyloma* is derived from the Greek words *makros* meaning large, *tylos* meaning knob and *loma* meaning margin, in reference to knobby statures on the pods. In India, horse gram is cultivated as a pulse crop contributing about 0.33 per cent of the total food grain production. The area of horse gram in India during 2019-2020 was 4.57 lakh hectares with production of 2.96 lakh tonnes and productivity of 649 kg ha^{-1} and in Maharashtra state during 2019-2020 the area was 12 thousand hectares with the production of 34 thousand tonnes and productivity of 283 kg ha^{-1}. Horse gram is an excellent source of protein (up to 25%), carbohydrates (60%), essential amino acids, energy, and low content of lipid (0.58%), iron and molybdenum (Bravo *et al*., 1999) [2]. Horse gram is an excellent source of dietary fibre. Horse gram is a hardy and a potential crop of future for dryland areas as well as a fodder crop of economic importance. It grows and thrives in a wide range of geographical locations varying in water availability. Horsegram is one such legume, which is easy to grow, resistant to pests and diseases, appeal to the eye and to the palate and highly nutritious. Though it is nutritious and beneficial to us its cultivation is neglected. In some few areas, it is cultivated in marginal land. It is important to exploit it and make aware the people about its value and encourage its production by the use of developed technology. In future it will occupy special position in pulse group though it is neglected today. With the production and nutritive point of view improvement of pulses can only be achieved when minor pulses like horse gram brings under cultivation with proper package and practices (Purushottam *et al*., 2017) [12]. Foliar application of nutrients is best than soil application because less quantity of fertilizer is required for the foliar application as compare to soil application. The prices of fertilizers are increasing day by day and therefore, it is necessary to reduce the cost of fertilizers by using foliar application of fertilizer to increase yield of legume crops. During last few years, it was observed that in Maharashtra there was continuous dry spell of 15 to 35 days during *kharif* season, which severely affect the growth and yield of *kharif* crops. It is evident that the foliar nutrition with N, P and K help in increasing drought resistance in plant and reduces the loss of water through evapotranspiration.

2. Materials and Methods

The present field experiment on "Effect of foliar application of nutrients on growth and yield of horse gram" was carried out during the *kharif* 2020 at NARP Dryland Sub Centre (Agroforestry), MPKV, Rahuri. The soil of experimental field was low in available nitrogen (176.40 kg ha^{-1}), low in phosphorus (10.60 kg ha^{-1}) and moderately high in potassium (358.27 kg ha^{-1}). The field experiment was laid out in a randomized block design with three replications. There were ten treatments *viz*., T_1: 1.5% Foliar spray of Urea, T_2: 2.0% Foliar spray of Urea, T_3: 1.5% Foliar spray of DAP, T_4: 2.0% Foliar spray of DAP, T_5: 1.5% Foliar spray of MOP, T_6: 2.0% Foliar spray of MOP, T_7: 1.5% Foliar spray of 19:19:19, T_8: 2.0% Foliar spray of 19:19:19, T_9: Water spray, T_{10}: Control. Sowing was done by dibbling by using seed rate 15 kg ha^{-1}. The gross and net plot size was 4.00 m × 3.00 m and 3.60 m × 2.40 m respectively. The total rainfall received during growth period of horse gram was 916 mm with 41 rainy days. The recommended dose of fertilizer 15: 30: 00 kg NPK ha^{-1} was applied to all treatment plots through single super phosphate and urea. Other cultural practices were done as per treatments. Statistical analysis of the data was carried out by using standard analysis of variance (Panse and Sukhatme 1985) [11].

3. Result and Discussion

3.1 Effect of foliar application of nutrients on growth parameters

The foliar application of water soluble fertilizer 19:19:19 (NPK) @ 2% at 35 & 45 DAS to horse gram crop reported significantly higher plant height (106.43 cm), dry matter production $plant^{-1}$ (22.60 g) which was at par with the foliar application of DAP @ 2% at 35 & 45 DAS with plant height (95.87 cm) and dry matter production $plant^{-1}$ (21.67 g). In case of periodical number of leaves $plant^{-1}$ and leaf area $plant^{-1}$, significantly the highest periodical number of leaves $plant^{-1}$ (177.87) and leaf area $plant^{-1}$ (284.59 dm^2) were observed at 90 DAS with foliar application of water soluble fertilizer 19:19:19 (NPK) @ 2% at 35 & 45 DAS which were at par with the foliar application of DAP @ 2% at 35 & 45 DAS with periodical number of leaves $plant^{-1}$ (164.60) and leaf area $plant^{-1}$ (263.36 dm^2) & foliar application of urea @ 2% at 35 & 45 DAS with periodical number of leaves $plant^{-1}$ (150.6) and leaf area $plant^{-1}$ (240.96 dm^2) in comparison to rest of nutrient management treatments. The increases in plant height, periodical number of functional leaves $plant^{-1}$, leaf area $plant^{-1}$ and dry matter accumulation might be due to increased availability of nitrogen, phosphorous and potassium which enhanced production of photosynthetic assimilates from increased photosynthetic rate. The similar results are reported by Mudalagiriyappa *et al*. (2013), Mamathashree *et al*. (2014) [9], Jadhav *et al*. (2017) [6], Takankhar *et al*. (2017) [17] and Kumari Nitu *et al*. (2019) [8].

3.2 Effect of foliar application of nutrients on yield contributing characters and yield

In relation of yield and yield contributing attributes which were significantly influenced by different treatments are presented in table 2. The horse gram crop supplied with foliar nutrition of water soluble fertilizer 19:19:19 (NPK) @ 2% at 35 & 45 DAS exhibited significantly higher yield attributing characters *viz*., number of pods $plant^{-1}$ (56.40), no. of grains pod^{-1} (6.00), pod length (6.47 cm), grain yield $plant^{-1}$ (3.68 g), which was at par with the foliar application of DAP @ 2% at 35 & 45 DAS with number of pods $plant^{-1}$ (49.93), no. of grains pod^{-1} (5.40), pod length (5.61 cm), grain yield $plant^{-1}$ (3.26 g) than other nutrient management treatments. However, diameter of pods (0.61 cm) and 100 grain weight (3.85 g) were not influenced significantly by foliar application of nutrients. The foliar application of water soluble fertilizer 19:19:19 (NPK) @ 2% at 35 & 45 DAS to horse gram produced significantly higher grain yield (1172.74 kg ha^{-1}) and straw yield (1871.57 kg ha^{-1}) as well as higher harvest index (38.55%) and yield increased over control (37.39%) in which the grain yield was at par with the, foliar application of DAP @ 2% (1097.54 kg ha^{-1}), water soluble fertilizer 19:19:19 (NPK) @ 1.5% (1053.29 kg ha^{-1}) and DAP @ 1.5% at 35 & 45 DAS (1037.56 kg ha^{-1}) and the straw yield was at par with the, foliar application of DAP @ 2% at 35 & 45 DAS with straw yield (1831.48 kg ha^{-1}) and yield increased over control (28.58%) as compared to other nutrient management treatments under study. The increase in yield may be attributed due to increase in all the growth and yield attributes. The better partitioning of photosynthates from sources to sink might have led to higher yield attributes, which finally resulted in higher grain yield of horse gram. The results are in association with Rajesh and paulpandi (2013) [13], Ali *et al*. (2013) [1], Mamathashree *et al*. (2014) [9], Das *et al*. (2015) [4], Jadhav and Kulkarni (2016) [5], Mudalagiriyappa *et al*. (2016) [10], Raut *et al*. (2016), Channabasavanna *et al*. (2017) [3], Takankhar *et al*. (2017) [17], Singh *et al*. (2018) [16], Shwetha *et al*. (2018) [15], Kumar *et al*. (2019) [7], Kumari Nitu *et al*. (2019) [8] and waghmare *et al*. (2019) [18]

Table 1: Effect of foliar application of nutrients on growth parameters

Treatment	Plant height (cm)	Number of functional leaves $plant^{-1}$	Leaf area $plant^{-1}$ (dm^2)	Dry matter production $plant^{-1}$ (g)
T_1: 1.5% Foliar spray of Urea	84.43	143.13	229.01	18.13
T_2: 2.0% Foliar spray of Urea	86.21	150.60	240.96	18.30
T_3: 1.5% Foliar spray of DAP	86.43	144.06	230.51	18.41
T_4: 2.0% Foliar spray of DAP	95.87	164.60	263.36	21.67
T_5: 1.5% Foliar spray of MOP	79.49	135.66	217.07	17.73
T_6: 2.0% Foliar spray of MOP	82.11	139.73	223.57	18.10
T_7: 1.5% Foliar spray of 19:19:19	89.74	145.00	232.00	18.73
T_8: 2.0% Foliar spray of 19:19:19	106.43	177.87	284.59	22.60
T_9: Water spray	75.83	130.00	208.00	16.36
T_{10}: Control	73.64	120.27	192.43	15.10
SE(m)±	4.94	9.64	15.43	1.20
C.D. at 5%	14.78	28.65	45.83	3.60
C.V	9.94	11.51	11.51	11.27
General Mean	86.32	145.09	232.15	18.91

Table 2: Effect of foliar application of nutrients on yield contributing characters and yield

Treatment	No. of pods plant^{-1}	No. of grains pod^{-1}	Pod length (cm)	Diameter of pod (cm)	Seed index (g)	Grain yield plant^{-1} (g)	Grain	Straw	Harvest index (%)	Yield increase over control (%)
T_1: 1.5% Foliar spray of Urea	41.60	4.40	4.62	0.55	3.62	3.02	969.10	1679.07	36.58	13.53
T_2: 2.0% Foliar spray of Urea	42.47	4.47	4.70	0.56	3.66	3.07	991.81	1702.35	36.81	16.19
T_3: 1.5% Foliar spray of DAP	45.67	4.53	4.95	0.58	3.70	3.10	1037.56	1746.51	37.27	21.55
T_4: 2.0% Foliar spray of DAP	49.93	5.40	5.61	0.60	3.80	3.26	1097.54	1831.48	37.47	28.58
T_5: 1.5% Foliar spray of MOP	39.87	4.35	4.42	0.50	3.59	2.99	948.75	1658.41	36.39	11.15
T_6: 2.0% Foliar spray of MOP	41.53	4.38	4.51	0.51	3.61	3.00	961.87	1672.34	36.51	12.68
T_7: 1.5% Foliar spray of 19:19:19	45.07	4.53	5.14	0.60	3.72	3.01	1053.29	1768.57	37.32	23.39
T_8: 2.0% Foliar spray of 19:19:19	56.40	6.00	6.47	0.61	3.85	3.68	1172.74	1871.57	38.55	37.39
T_9: Water spray	41.47	4.32	4.09	0.48	3.36	2.88	937.64	1650.97	36.18	9.85
T_{10}: Control	38.87	4.30	3.89	0.46	3.25	2.55	853.60	1623.13	34.49	0
SE(m)±	3.46	0.28	0.34	0.04	0.17	0.19	57.37	31.93	0.81	-
C.D. at 5%	10.27	0.83	1.01	NS	NS	0.56	170.46	94.86	NS	-
General Mean	44.29	4.70	4.84	0.55	3.62	3.05	1002.39	1720.44	36.76	-

4. Conclusion

The foliar application of water soluble fertilizer 19:19:19 (NPK) @ 2% at 35 and 45 days after sowing to horse gram crop found better for higher growth and yield attributes as well as grain yield.

5. References

1. Ali EA, Mahmoud AM. Effect of foliar spray by different salicylic acid and zinc concentrations on seed yield and yield components of mungbean in sandy soil. Asian Journal of Crop Science 2013;5(1):33-40.
2. Bravo L, Siddhuraju P, Saura-Calixto F. Composition of under exploited Indian pulses. Comparison with common legumes. Food Chemistry 1999;64:185-192.
3. Channabasavanna AS, Kitturmath MS, Rajakumar H. Effect of soil and foliar application of micro nutrients and fertilizers on growth and yield of Pigeonpea [*Cajanus cajan* (L.) Millsp.]. International Journal of Farm Sciences 2017;30(3):424-425.
4. Das, Sreeloy, Jana Kalyan. Effect of foliar spray of water soluble fertilizer at pre flowering stage on yield of pulses. Agricultural Science Digest - A Research Journal 2015;35(4):275-279.
5. Jadhav RL, Kulkarni S. Effect of foliar spray of nutrients on productivity of greengram (*Vigna radiata*) in North Eastern transitional zone of Karnataka, India. Legume Research 2016;39(5):817-819.
6. Jadhav SM, Takankhar VG, Raja D, Kumbhar CS. Influence of foliar nutrition on growth characters of black gram (*Vigna mungo* L.) under rainfed condition. Agriculture Update 2017;12(8):2015-2020.
7. Kumar D, Singh RP, Vidya Simaiya. Effect of foliar application of nutrients on yield and economics of blackgram (*Vigna mungo* (L.) Hepper) under rainfed Vertisols of Central India. Journal of Pharmacognosy and Phytochemistry 2019;8(1):2373-2376.
8. Kumari Nitu RP, Manjhi S, Karmakar P, Mahapatra, Yadava MS. Impact of foliar nutrition on productivity and profitability of green gram (*Vigna radiata* L.). International Journal of Agriculture Sciences 2019;11(7):8168-8172.
9. Mamathashree CM. Effect of foliar spray of water soluble fertilizers on growth and yield of pigeonpea (*Cajanus cajan* (L.) mill sp.). M.Sc. (Ag.) Thesis, University of Agricultural Sciences, Dharwad 2014.
10. Mudalagiriyappa M, Ali B, Ramachandrappa, Nagaraju, Shankaralingappa B. Effect of foliar application of water soluble fertilizers on growth, yield and economics of chickpea (*Cicer arietinum* L.). Legume Research – An International Journal 2016;39(4):610-613.
11. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers, ICAR. Publication IST Impression in 1954 1985.
12. Purushottam, Kumar R, Barman R, Saren BK. Improvement of neglected horse gram production for benefit of mankind. International Journal Bio-research Environment Agricultural Sciences 2017;3(2):521-527.
13. Rajesh N, Paulpandi VK. Review of foliar nutrition in redgram enhancing the growth and yield characters. *American* International Journal of Research in Formal, Applied and Natural Sciences 2013;13(142):9-14.
14. Raut SD, Mahadkar UV, Nitave SS, Rajemahadik VA. Effect of different methods of fertilizer application and varying tillage conditions on nutrient content, uptake, quality and soil fertility of horse gram. Environment & Ecology 2012;35(2D):1429-1433.
15. Shwetha BN, Anupama C, Sowmya TM, Raghavendra Yaligar. Effect of foliar nutrition on productivity of groundnut crop. Journal of Pharmacognosy and Phytochemistry 2018;SP1:2357-2360.
16. Singh AK, Singh CS, Singh AK, Karmakar S. Soybean productivity as influenced by foliar application of nutrients. Journal of Pharmacognosy and Phytochemistry 2018;SP1:413-415.
17. Takankhar VG, Karanjikar PN, Bhoye SR. Effect of foliar nutrition on growth, yield and quality of chickpea (*Cicer arietinum* L.). Asian Journal of Soil Science 2017;12(2):296-299.
18. Waghmare YV, Thaokar AC, Gawali KA, Nagmote AV, Sarda A. Impact of foliar application of water soluble NPK fertilizers on yield, nutrient uptake and quality of gram (*Cicer arietinum*. L). Journal of Pharmacognosy and Phytochemistry 2019;8(5):290-292.