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Effect of different levels and sources of nitrogen on grade wise tuber and total tuber yield

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Abstract
Potato growing in north Gujarat is most prevalent practice since last so many years. It is important *rabi* crop and gives good amount of money per unit area with best management practice. Different fertilizers are applied by the farmers during potato growing in basal as well as top dressing. If fertilizers are to be given in drip system it will reduce the cost of application and increase fertilizer use efficiency of applied fertilizers. In the market different types of water soluble fertilizers are available now days, so to find out the best nitrogen source of fertilizers and to determine the optimum doses of said fertilizers in drip, this experiment is formulated. The experiment were undertaken during *rabi* 2019, 2020 and 2021 at Agricultural Research Station, S.D. Agricultural University, Aseda (Gujarat). The treatments comprised of three levels of source of nitrogen (S): S_1: Urea, S_2: 17-44 + micro nutrient grade III (1.0%), S_3: WSF 19-19-19 and three levels of nitrogen (N) N_1: 100% RDN, N_2: 75% RDN, N_3: 50% RDN.The experiment was laid out in a factorial randomized block design with three replications. Significantly higher tuber yield were recorded under the WSF 19-19-19 (38.99 t/ha) and 100% (RDN) treatment (36.92 t/ha). Interaction effect showed no significant result.

Keywords: Source of fertilizers, nitrogen, grade wise tuber yield, total tuber yield

Introduction
Potato (*Solanum tuberosum* L.) is one of most important solanaceous vegetable crops which contributing to the world food requirements and occupied the fourth position after rice, wheat, and maize in production size (Walker *et al*., 1999) [16]. The potato is most important tuber crops in India and grown worldwide. It is produced higher under Uttar Pradesh state of about 15892 thousand tones with share of 29% of total country production followed by West Bengal (23.51%), Bihar (17.02%) and Gujarat (3780 thousand tones with shares of 7.05% of total country production) as per report of NHB 2021-22. The area of potatoes harvested globally generally decreased from 2002 to 2020, before increasing again in 2021. The harvested area in 2021 was approximately 18.13 million hectares, an increase of over seven percent compared to the previous year. (Anonymus, 2023) [1]. Several reports compared the organic and synthetic fertilization of potato and revealed that best results are achieved by the last practice in terms of quantity and quality of tubers (Palmer *et al*., 2013; Singh and Lallawmkima, 2018) [12, 15]. Overuse of the mineral fertilizers for long period not only makes soils degraded, polluted and less productive but have also posed severe health and environmental problems (Cockburn *et al*., 2011) [3].

Materials and Methods
A field experiment was conducted consecutively for three years in *rabi* season of 2019, 2020 and 2021 at the Agricultural Research Station, S.D. Agricultural University on the fixed plots. Factorial Randomized complete block design with three replications were used to study the response of sources and levels of nitrogen on potato tuber yield through drip fertigation. The texture of the soil was loamy sand. The soil of the experimental field was low in available N (192 kg/ha), medium in available P (18 kg/ha) and available K (190.0 kg/ha) and normal in soil reaction (pH 7.58) and electrical conductivity (0.2 mmhos/cm). The treatments comprised of three levels of ssource of nitrogen (S): S_1: Urea, S_2: 17-44 + micro nutrient grade III (1.0%), S_3: WSF 19-19-19 and three levels of nitrogen (N)N_1: 100% RDN, N_2: 75% RDN, N_3: 50 % RDN. Source of nitrogen applied in five equal split at ten days Intervals in drip irrigation. Entire quantities of phosphorus and potash have been applied as basal in form of SSP and MOP in treatment S_1 and S_2. Soil samples were taken before treatments application and after completion of experiment to know the status of soil nutrient content and effect of nutrient

imposition. The data were analyzed statistically by standard analysis of variance (ANOVA). Least significant difference (LSD) test was used to determine whether differences exist between certain comparisons. The probability level for determination of significance was 0.05.

Results and Discussion

0-25 g (t/ha): During the year 2018-19, 2019-20 and 2020-21, the grade wise tuber yield were affected significantly with application of different source and levels of fertilizers. In case of source of fertilizers, significantly higher value of lower grade 0-25 g tuber yield were recorded under the treatment S_1: Urea which remained at par with S3: WSF 19-19-19. In case of the Levels of fertilizers, it remained non-significant. The interaction effect shows that S1N3 recorded higher value lower grade yield over rest of combinations.

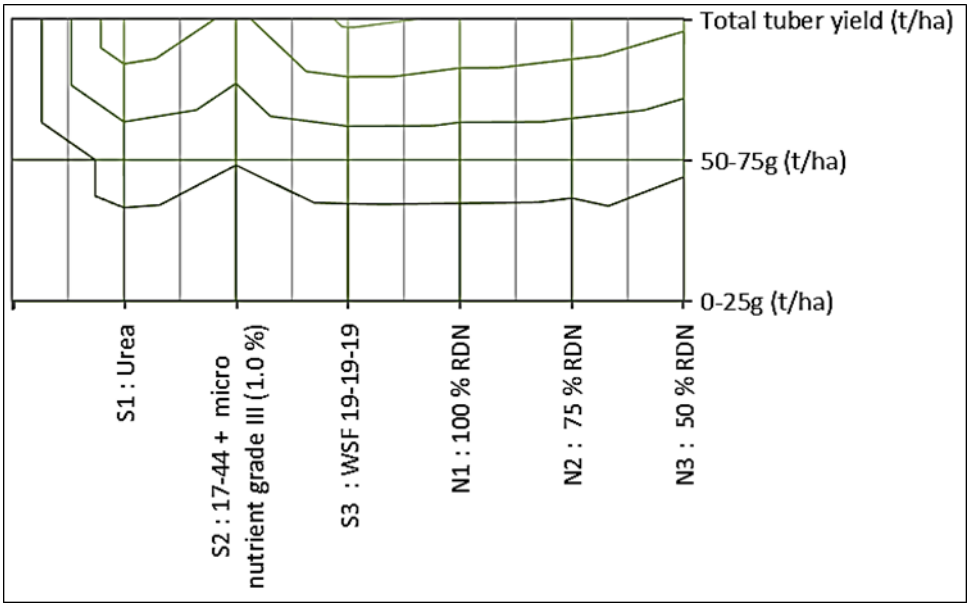

Fig 1: Effect of Source and levels of nitrogen on grade wise tuber yield of potato (t/ha) for the year 2018-19

25-50 g (t/ha): The yield of the tuber of 25-50g size was affected significantly with the application of different source and levels of fertilizers. In case of different sources, in case of source of fertilizers, significantly higher-grade wise tuber yield were recorded under the treatment S3: WSF 19-19-19 and remained statistically at par with the treatment of S1: urea during all three years. In case of the Levels of fertilizers higher grade wise tuber yield were recorded under the treatment N1:100% RDN and remained statistically at par with the treatment N2: 75% RDN. The lower value of tuber yield was recorded under the S2: 17-44 + micro nutrient grade III (1.0%) and N_3: 50% RDN.

50-75 g (t/ha): The medium sized tuber yield also significantly affected by the different source and levels of nitrogen. Higher yield of grade 50-75 g tuber was recorded under the treatment S3: WSF 19-19-19 and remained statistically at par with the treatment of S1: urea during 2018-19, 2019-20 and 2020-2, while 100% nitrogen application recorded significantly higher yield of tubers and remained at par with 75% nitrogen application through drip fertigation.

>75 g (t/ha): The bigger size of good quality and appearance of tuber also significantly affected with the different sources and levels of nitrogen fertilizers. The higher bigger

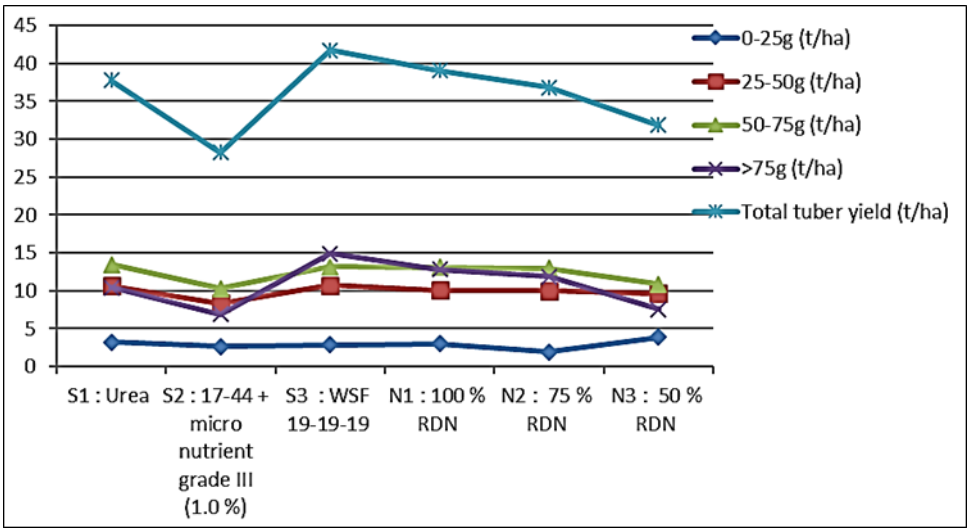

Fig 2: Effect of Source and levels of nitrogen on grade wise tuber yield of potato (t/ha) for the year 2019-20

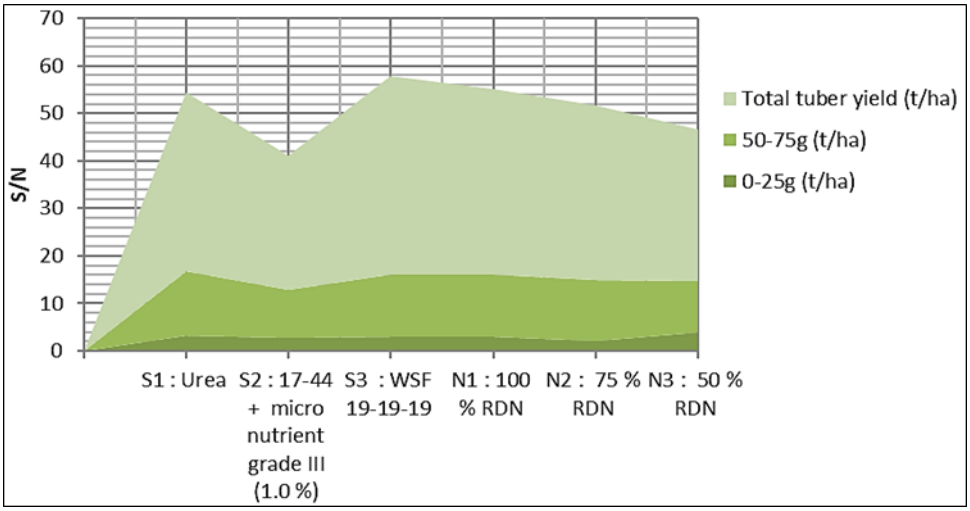

Fig 3: Effect of Source and levels of nitrogen on grade wise tuber yield of potato (t/ha) for the year 2020-21

size grade tuber yield was recorded with the application of WSF 19-19-19 and remained statistically at par with the application of urea, while in case of different levels, the higher yield was recorded under the 100% RDN application and remained statistically at par with the 75% RDN application. The lower yield was recorded under the S2N3.

Total Tuber yield: In case of source of fertilizers, significantly highest total tuber yield (40.08 t/ha) was recorded under the WSF 19-19-19, while among different levels of nitrogen N_1: 100% RDN recorded significantly higher value of total tuber (37.75t/ha) and remained statistically at par with the treatment N_2: 75% RDN. The interaction effected remained non-significant. Yield increased by the N rate. The soil N application gave higher yield than the zero N and lower than the fustigated treatment found by Mohammad *et al*., 1999 [9]. Seasonal (split) nitrogen.

Table 1: Effect of sources and levels of nitrogen on total tuber yield (t/ha) of potato under drip fertigation (Pooled)

Treatments	Total tuber yield (t/ha)			
	2018-19	2019-20	2020-21	Pooled
S. Source of Nitrogen (S)				
S1: Urea	34.47	37.78	35.45	35.90
S2: 17-44 + micro nutrient grade III (1.0%)	29.483	28.23	29.77	29.16
S3: WSF 19-19-19	38.99	41.72	39.54	40.08
SEm +	1.62	1.18	1.16	0.77
CD at 5%	4.87	3.56	3.49	2.21
N. Levels of Nitrogen (N)				
N1: 100% RDN	36.92	39.04	37.29	37.75
N2: 75% RDN	35.4	36.82	34.85	35.71
N3: 50% RDN	30.57	31.86	32.61	31.68
SEm +	1.62	1.19	1.16	0.77
CD at 5%	4.87	3.56	3.49	2.20
Interaction (S x N)				
S x N	NS	NS	NS	NS
YXSXN				NS
C.V %	14.21	9.93	10.01	11.50

management is proposed as a method to improve yield, quality and nitrogen fertilizer use efficiency of in determinant cultivars reported by Ojala *et al*. (1990) [10], Ghiyal and Bhatia (2018) [4], Jannat (2010) [6], Fertigation resulted increased in crop yield by 20 to 30% reported by Sandal *et al*. (2015) [13], Sharma and Arora (2009) [14], Kumar *et al*. (2007) [8], Walter *et al*. (2001) [17], Jenkins and Nelson (1992) [7] and Yourtchi *et al*. (2013) [18].

For fetching the higher tuber yield of potato, when it has been cultivated through drip, it should be fertilized with 25% less nitrogenous fertilizer than the recommended fertilizer through urea in five equal split after 20 days after planting, while entire quantity of phosphorus and potash to be applied as basal at time of planting.

Conclusions

From the foregoing discussion it can be concluded that the one of which taking potato crop under drip irrigation and wishing to obtain higher tuber yield of big grade (>75 g), the potato crop should be fertigated with urea as source of fertilizers at 75% recommended dose of nitrogen in five equal split at 10 days interval.

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References

1. Anonymus; c2023. https://www.statista.com/statistics/1038959/india-production-of-potato/
2. Ashrafi MR, Raj M, Shamim S, Lal K, Kumar G. Effect of fertigation on crop productivity and nutrient use efficiency. Journal of Pharmacognosy Phytochemistry. 2020;9(5):2937-2942.
3. Cockburn MP, Mills X, Zhang J, Zadnick D, Goldberg, Ritz B. Prostate cancer and ambient pesticide exposure in agriculturally intensive areas in California. American Journal of Epidemiology. 2011;173:1280-1288.
4. Ghiyal V, Bhatia AK. Effect of nitrogen levels and fertigation frequency on the growth parameters and yield of potato tuber (*Solanum tuberosum* L.) cv. Kufri Bahar. Journal of Pharmacognosy and Phytochemistry. 2018;**7**(4):2064-2067.
5. Guler S. Effects of nitrogen on yield and chlorophyll of potato (*Solanum tuberosum* L.) cultivars. Bangladesh Journal of Botany. 2010;38(2):163-169.
6. Jannat M. Efficiency of nitrogen fertilizer for potato under fertigation utilizing a nitrogen tracer technique. Communications in soil science and plant analysis. 2010;38:17-18.
7. Jenkins PD, Nelson DG. Aspects of nitrogen fertilizer rate on tuber dry-matter content of potato cv. Record. Potato Research. 1992;35:127-132.
8. Kumar P, Pandey SL, Singh BP, Singh SV, Kumar D. Effect of Nitrogen Rate on Growth, Yield, Economics and Crisps Quality of Indian Potato Processing Cultivars. Potato Research. 2007;50:143-155.
9. Mohammad MJ, Zuraiqui S, Quasmeh W, Papadopoulos I. Yield response and nitrogen utilization efficiency by drip-irrigated potato. Nutrient cycling in Agroecosystems. 1999;54:243-249.
10. Ojala JC, Stark JC, Kleinkopf GE. Influence of irrigation and nitrogen management on potato yield and quality. American Potato Journal. 1990;67:29-43.
11. Olsen CR, Cole CV, Watanabe FS, Dean LA. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. US of Agric. Circ., 1954, 939.
12. Palmer MW, Cooper J, Tétard-Jones C, Œrednicka-Tober D, Barañski M, Eyre M, *et al*. The influence of organic and conventional fertilization and crop protection practices, preceding crop, harvest year and weather conditions on yield and quality of potato (Solanum tuberosum) in a long-term management trial. European Journal of Agronomy. 2013;49:83-92.
13. Sandal SK, Kapoor R. Fertigation technology for enhancing nutrient use and crop productivity: An overview. Himachal Journal of Agricultural Research. 2015;41(2):114-121.
14. Sharma UC, Arora BR. Effect of nitrogen, phosphorus and potassium application on yield of potato tubers (*Solatium tuberosum* L.) Journal of Agricultural Science. 2009;108(2):321-329.
15. Singh SK, Lallawmkima I. Multisource Nutrient Application in Potato for High Grade Tuber Production. Acta Scientific Agriculture. 2018;2:54-58.
16. Walker B, Kinzig A, Langdridge J. Plant Attribute Diversity, Resilience and Ecosystem Function: The Nature and Significance of Dominant and Minor Species. Journal of Ecosystems. 1999;2:95.
17. Walter JA, Debby AL, George CCT, Peter B. Effects of nitrogen application and seed piece spacing on yield and tuber size distribution in eight potato cultivars. American Journal of Potato Research. 2001;78:301-309.
18. Yourtchi MS, Hadi MH, Darzi MT. Effect of nitrogen fertilizer and vermicompost on vegetative growth, yield and NPK uptake by tuber of potato (Agria CV.). International Journal of Agriculture and Crop Sciences. 2013;5(18):2033-2040.