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Effect of nutrient management on growth and yield of potato

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Abstract
The research investigates the synergistic effects of different green manure crops and nutrient management practices on the growth and yield of potato (*Solanum tuberosum* L.). A two-year field experiment was conducted during 2018-19 and 2019-20 to assess the impact on plant height, number of tubers per plant, dry weight of shoots per plant, dry weight of tubers per plant, total tuber yield, and haulm yield. Three green manure crops—sunnhemp, cowpea, and cluster bean—were studied alongside various nutrient management treatments.

The results revealed that sunnhemp incorporation significantly outperformed cowpea and cluster bean, demonstrating higher plant height, increased number of tubers per plant, elevated dry weight of shoots per plant, and enhanced dry weight of tubers per plant. Sunnhemp, with its substantial contribution to organic matter and nutrient content, positively influenced soil health, resulting in larger tubers and higher total tuber yield. Furthermore, nutrient management practices significantly impacted various growth parameters. The application of 100% recommended dose of fertilizer (RDF) along with farmyard manure (FYM) at 25 t/ha consistently led to superior outcomes, emphasizing the importance of balanced nutrition. The integration of sunnhemp as a green manure crop, coupled with 100% RDF + FYM 25 t/ha, demonstrated the most promising results, achieving higher plant height, increased tuber numbers, and elevated tuber weight.

The findings underline the intricate interplay between green manure crops and nutrient management practices in influencing potato growth and yield. The identified optimal combinations and practices provide practical insights for farmers aiming to enhance potato crop productivity sustainably. This study contributes valuable knowledge to the field of crop science, emphasizing the significance of tailored approaches for maximizing potato yield while ensuring soil health and environmental sustainability.

Keywords: Green manure, potato, nutrient management, growth and yield

Introduction
Potato (*Solanum tuberosum* L.) is a crucial global crop, consumed worldwide as both food and vegetable. It is considered an essential food crop, contributing significantly to food and nutritional security. Potatoes contain 77.2% water and the remaining dry matter includes starch, sugar, protein, minerals, fiber, crude fat, vitamin A, and vitamin C (Bose *et al*., 1993) [1]. Potato is grown globally in 19.30 million hectares, producing 388.20 million tonnes. In India, it ranks 3rd in terms of area and 2nd in production, with major cultivation in states like Uttar Pradesh, West Bengal, Bihar, Gujarat, and others (FAO, 2018) [3]. Inadequate and imbalanced nutrient application by farmers is a significant limiting factor for low crop productivity, especially in potato cultivation. Green manuring, using crops like Dhaincha, Sunnhemp, Cowpea, etc., helps in soil improvement, providing essential nutrients, and reducing the reliance on chemical fertilizers. It is particularly crucial in sustaining soil health. The passage highlights the importance of nitrogen, phosphorus, and potassium in potato cultivation. Their balanced application is crucial for improved yield, quality, and tuber development. Intensive cropping, especially in North Gujarat, leads to rapid soil potassium depletion. Balanced fertilization is emphasized for sustainable potato production. The integration of organic sources like Farm Yard Manure (FYM) with chemical fertilizers is recommended for better nutrient management, soil structure, and microbial activity. Farm Yard Manure provides a suitable mineral balance, improves nutrient availability, enhances soil structure, and increases Cation Exchange Capacity (CEC). It contains nitrogen, phosphorus, potassium, and micronutrients. The proper integration of organic and inorganic nutrient sources, along with green manuring, is essential for sustaining and enhancing potato yield.

Materials and Methods

The field experiment took place on plot number B-6 during the *rabi* seasons of 2018-19 and 2019-20 at the Agronomy Instructional Farm in Banaskantha, Gujarat. Sardarkrushinagar is located at 24˚19' North latitude and 72˚19' East longitude, with an elevation of 154.52 meters above mean sea level. The region falls under the North Gujarat Agro climatic zone. The climate of Sardarkrushinagar is described as a sub-tropical monsoon type, typical of a semi-arid region. Monsoons are warm and moderately humid, winters are cold and dry, and summers are hot and dry. The winter season spans from the middle of October to the middle of February, with minimum temperatures observed in December or January. Temperature starts rising, reaching its maximum in May, with April and May being the hottest months of the year. The experimental field features an even topography with a gentle slope, ensuring good drainage. Soil samples were randomly taken from the experimental field to a depth of 0-15 cm before the experiment began. These samples were then combined to create a composite soil sample. The composite soil sample underwent analysis for both physical and chemical properties. The experimental field is characterized as loamy sand in texture of soil. Loamy sand typically contains a balanced mixture of sand, silt, and clay, providing good drainage while retaining some water and nutrients. The soil was found to be low in organic carbon and available nitrogen. However, it was classified as medium in terms of available phosphorus and potash. The experiment employed a split plot design (SPD) with four replications. Three green manure crops were evaluated in the main plot treatments (sunnhemp, cowpea and cluster bean). The nutrient management treatments for the potato crop during the *rabi* season were assigned to subplots. Six levels of nutrient management were considered N_1: 100% RDF + FYM @ 25 t/ha, N_2: 100% RDF + FYM @ 12.5 t/ha, N_3: 100% RDF, N_4: 75% RDF + FYM @ 25 t/ha, N_5: 75% RDF + FYM @ 12.5 t/ha and N_6: 75% RDF. The recommended dose of fertilizer (RDF) for potato is 275:137.5:275 kg NPK/ha. Fertilizers were not applied to the green manure crops during the *kharif* season.

Results and Discussion

Effect on Plant Height

Plant height of potato was significantly influenced by green manure crops and nutrient management practices at all studied growth stages in both years and in pooled results. Sunnhemp resulted in the highest plant height at 60 DAP and at harvest, significantly surpassing cowpea and cluster bean. Sunnhemp incorporation recorded the maximum plant height at 60 DAP and at harvest during both years and in pooled results. Sunnhemp demonstrated a significant increase in plant height over cluster bean, indicating better nutrient availability. Different nutrient management treatments significantly influenced plant heights at 60 DAP and at harvest in both years and in pooled analysis. The application of 100% RDF + FYM 25 t/ha resulted in the tallest plants, statistically at par with 100% RDF + FYM 12.5 t/ha and 75% RDF + FYM 25 t/ha. The integrated use of organic and inorganic sources, especially 100% RDF + FYM 25 t/ha, contributed to balanced nutrition and favorable soil conditions, resulting in increased nutrient-use efficiency and higher plant height. Nitrogen, phosphorus, and potassium from fertilizer applications positively impacted plant growth by stimulating cell division, providing energy for growth processes, and serving as a structural part of plant molecules. The findings align with previous studies by Yadav *et al*. (2014) [11], Patil (2016) [6], and others, supporting the idea that nutrient management practices influence plant height in crops.

Effect on number of tubers per plant

Various green manure crops significantly differed in terms of the number of tubers per plant during both experimentation years and on a pooled basis. Sunnhemp incorporation resulted in the highest number of tubers per plant, while cluster bean recorded the lowest. Cowpea was statistically similar to cluster bean but lower than sunnhemp. Sunnhemp contributed higher quantities of green biomass to the soil, leading to increased translocation of photosynthates from the vegetative to the reproductive part of the plant. The number of tubers per plant increased by 9.26% and 12.93% over cowpea and cluster bean, respectively, when sunnhemp was used as a green manure crop in potato.

Different nutrient management practices significantly influenced the number of tubers per plant in potato crops. The application of 100% RDF + FYM 25 t/ha resulted in the highest number of tubers per plant, statistically at par with 75% RDF + FYM 25 t/ha. The application of FYM at 25 t/ha contributed additional plant nutrients and increased the availability of native soil nutrients due to increased microbial activity, resulting in a higher number of tubers per plant.

The interaction between green manure crops and nutrient management was found to be significant. The highest number of tubers per plant was obtained when sunnhemp was incorporated during the preceding season (*kharif*), and 100% RDF + FYM 25 t/ha was applied to the potato crop. Sunnhemp with 75% RDF + FYM 25 t/ha and 100% RDF + FYM 12.5 t/ha also showed similar results. The integrated nutrient sources from sunnhemp or cowpea and the subsequent application of 100% RDF + FYM 25 t/ha contributed to improved soil fertility. This, in turn, enhanced cell activities, stimulated cell multiplication, and promoted the growth of the crops, resulting in the initiation of a greater number of stolons in potatoes. The results align with the findings of Patil (2016) [6], reinforcing the positive impact of certain green manure crops, such as sunnhemp and cowpea, when integrated with specific nutrient management practices.

Effect on dry weight of shoots per plant

Various green manure crops significantly differed in terms of the dry weight of shoots per plant during both years of experimentation and on a pooled basis. Sunnhemp incorporation during the *kharif* season resulted in significantly higher dry weight of shoots per plant at harvest (31.63 g, 31.19 g, and 31.41 g) compared to cowpea and cluster bean. Sunnhemp, being rich in nutrients and registering the maximum available nutrients in the soil before planting potatoes, contributed to better growth. The maximum plant height achieved with sunnhemp is also mentioned as a contributing factor to the higher dry weight of shoots per plant. The findings are consistent with previous research by Sincik *et al*. (2008) [8] and Singh *et al*. (2019) [9], emphasizing the positive impact of sunnhemp on plant growth parameters.

Different nutrient management treatments significantly influenced the dry weight of shoots per plant at harvest. Application of 100% RDF + FYM 25 t/ha resulted in the highest dry weight of shoots per plant, statistically similar to

75% RDF + FYM 25 t/ha and 100% RDF + FYM 12.5 t/ha. The low nitrogen, medium phosphorous, and high potash soil fertility status influenced the response of the potato crop to fertilizer doses. Higher doses of fertilizers and organic manure (100% or 75% RDF + FYM 25 t/ha) stimulated increased stem formation, enhanced photosynthetic activity, and resulted in a higher crop growth rate, leading to a higher dry weight of shoots per plant. The results emphasize the importance of selecting suitable green manure crops and nutrient management practices to optimize the growth and yield of potato crops.

Effect on dry weight of tubers per plant

Various green manure crops significantly differed in terms of the dry weight of tubers per plant during both years of experimentation and on a pooled basis. Sunnhemp incorporation during the *kharif* season resulted in significantly higher dry weight of tubers per plant (115.82 g, 119.02 g, and 117.42 g) compared to cowpea and cluster bean. Cluster bean consistently recorded significantly lower dry weight of tubers per plant (102.36 g, 101.37 g, and 101.86 g) compared to the other green manure crops. Sunnhemp higher addition of organic matter, in terms of green biomass, provided not only nutrients but also improved soil structure, maintained soil moisture, and enhanced microbial activity. These factors collectively created a favorable environment for tuber development, resulting in larger tubers and, consequently, a higher dry weight per plant. Findings are consistent with previous research by Sincik *et al*. (2008) [8] and Singh *et al*. (2019) [9].

Different nutrient management treatments significantly influenced the dry weight of tubers per plant at harvest during both years and on a pooled basis. Application of 100% RDF along with FYM 25 t/ha resulted in the highest dry weight of tubers per plant, statistically similar to 75% RDF + FYM 25 t/ha and 100% RDF + FYM 12.5 t/ha. The lowest dry weight of tubers per plant was recorded with 75% RDF alone but was statistically similar to 75% RDF + FYM 12.5 t/ha and 100% RDF. Adequate nutrient supply through the recommended dose of fertilizer, combined with organic sources like FYM, led to better plant growth, increased production of photosynthates, and larger tuber size. The combination of 100% RDF with either FYM 25 t/ha or 12.5 t/ha, and 75% RDF + FYM 25 t/ha, resulted in larger-sized tubers and increased numbers of tubers per plant, contributing to a higher dry weight per plant. Results align with findings reported by Patil (2016) [6] and Taha *et al*. (2017) [10].

Effect on total tuber yield

Various green manure crops significantly differed in terms of total tuber yield during both years and on a pooled basis. Sunnhemp incorporation during the *kharif* season resulted in significantly higher total tuber yield (44.58 t/ha, 45.38 t/ha, and 44.98 t/ha) compared to cowpea and cluster bean. Clusterbean consistently recorded significantly lower total tuber yield (39.75 t/ha, 40.06 t/ha, and 39.90 t/ha) compared to the other green manure crops. On a pooled basis, total tuber yield with sunnhemp increased by 8.69% and 12.72% over cowpea and cluster bean, respectively. Sunnhemp, with its higher addition of organic matter and nutrient content, contributed to improved soil health, enhanced microbial activity, and created a favorable environment for tuber development. The increased number of tubers, higher dry weight of tubers per plant, and larger tuber size with sunnhemp resulted in a significant increase in total tuber yield. Findings align with previous studies by Sincik *et al*. (2008) [8], Prabhudeva (2014) [7], and Patil (2016) [6].

Different nutrient management practices significantly influenced total tuber yield during both years and on a pooled basis. Application of 100% RDF + FYM 25 t/ha resulted in significantly higher total tuber yield, statistically similar to 75% RDF + FYM 25 t/ha and 100% RDF + FYM 12.5 t/ha. The lowest total tuber yield was recorded with 75% RDF alone but was statistically similar to 75% RDF + FYM 12.5 t/ha. Combined application of fertilizer (RDF) and organic matter (FYM) at higher levels significantly increased total tuber yield compared to lower levels or RDF alone. Results are consistent with the findings of Patil (2016) [6], Mukherjee (2017) [5], Koireng *et al*. (2018) [4], and Dev *et al*. (2020) [2].

The interaction between green manure crops and nutrient management practices significantly influenced total tuber yield. Sunnhemp incorporation during the *kharif* season, followed by 100% RDF + FYM 25 t/ha, resulted in the highest total tuber yield during both years and on a pooled basis. Sunnhemp or cowpea, along with 100% RDF + FYM 25 t/ha, produced statistically similar total tuber yields, indicating the effectiveness of these combinations. Clusterbean incorporation with 75% RDF resulted in the lowest total tuber yield. Suitable combinations, such as sunnhemp with 100% or 75% RDF or cowpea with 100% RDF along with FYM 25 t/ha, proved effective for higher total tuber yield. The selected green manure crop and nutrient management practices improved soil health, creating favorable conditions for potato growth and development. Results support the findings of Prabhudeva (2014) [7] and Patil (2016) [6].

Effect on haulm yield

The data presented in table 6 of various green manure crops significantly differed in terms of haulm yield of potato during both years and on a pooled basis. Sunnhemp incorporation during the *kharif* season resulted in significantly higher haulm yield (30.68 q/ha, 31.78 q/ha, and 31.23 q/ha) compared to cowpea and cluster bean. Clusterbean consistently recorded significantly lower haulm yield (26.98 q/ha, 27.82 q/ha, and 27.40 q/ha) compared to the other green manure crops. Haulm yield with cowpea was intermediate, statistically similar to clusterbean but lower than sunnhemp. Sunnhemp's higher green biomass production contributed to increased nutrient supply, resulting in a higher leaf area index and plant height. The higher dry weight of shoots per plant, attributed to sunnhemp, positively influenced haulm yield, outperforming cowpea and cluster bean. Results align with previous studies by Sincik *et al*. (2008) [8], Prabhudeva (2014) [7], and Patil (2016) [6]. Sunnhemp incorporation during the *kharif* season proved to be the most effective in increasing haulm yield of potato. The higher green biomass production by sunnhemp contributed to improved nutrient availability, resulting in enhanced leaf area and plant height. These factors collectively led to a significant increase in haulm yield compared to cowpea and clusterbean.

Different nutrient management practices significantly influenced the haulm yield of potato during both years and in the pooled analysis. Application of 100% RDF + FYM 25 t/ha resulted in significantly higher haulm yield (30.25 q/ha, 31.24 q/ha, and 30.75 q/ha) during 2018-19, 2019-20, and on a

pooled basis, respectively. 75% RDF + FYM 25 t/ha and 100% RDF + FYM 12.5 t/ha also recorded haulm yields at par with each other and significantly higher than other nutrient management practices. Significantly lowest haulm yield (26.61 q/ha, 27.73 q/ha, and 27.17 q/ha) was observed with 75% RDF alone. Higher doses of FYM (25 t/ha) in combination with either 100% or 75% RDF significantly enhanced haulm yield. The application of 100% RDF + FYM 25 t/ha resulted in the highest haulm yield, indicating the positive impact of balanced nutrition and improved soil properties. On a pooled basis, the application of 100% RDF + FYM 25 t/ha led to a substantial increase in haulm yield, ranging from 7.06% to 13.16% over other nutrient management practices (100% RDF, 75% RDF + FYM 12.5 t/ha, and 75% RDF). The study highlights the significant influence of nutrient management practices on haulm yield in potato crops. Balanced nutrition, especially with higher doses of FYM (25 t/ha) in combination with either 100% or 75% RDF, positively impacted soil properties and nutrient availability, leading to increased haulm yield. These findings align with previous research by Patil (2016) [6] and Mukherjee (2017) [5], emphasizing the importance of balanced nutrient management for improved potato crop performance.

Table 1: Effect of different green manure crops and nutrient management treatments on plant height at 60 DAP and at harvest of potato

Treatment	Plant height (cm)					
	60 DAP			At harvest		
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
(G): Main plot: Green manure crops (*kharif* season)						
G_1: Sunnhemp	37.4	38.4	37.9	49.0	49.7	49.3
G_2: Cowpea	33.7	34.0	33.9	45.2	45.3	45.2
G_3: Cluster bean	32.2	32.4	32.3	43.5	43.8	43.7
S.Em.±	0.93	0.96	0.60	0.98	1.08	0.67
C.D. at 5%	3.23	3.33	1.84	3.41	3.75	2.08
C.V.%	13.28	13.49	11.94	10.51	11.46	10.13
(N): Sub plot: Nutrient management treatments to potato crop (*rabi* season)						
N_1: 100% RDF + FYM @ 25 t/ha	37.1	37.7	37.4	48.7	49.1	48.9
N_2: 100% RDF + FYM @ 12.5 t/ha	35.3	35.5	35.4	47.0	46.9	46.9
N_3: 100% RDF	33.6	34.4	34.0	44.8	45.6	45.2
N_4: 75% RDF + FYM @ 25 t/ha	35.8	36.0	35.9	47.7	47.5	47.6
N_5: 75% RDF + FYM @ 12.5 t/ha	32.9	33.8	33.3	44.3	45.2	44.7
N_6: 75% RDF	32.0	32.4	32.2	42.9	43.5	43.2
S.Em.±	1.07	0.86	0.70	1.19	1.01	0.80
C.D. at 5%	3.03	2.46	1.98	3.40	2.88	2.23
C.V.%	10.72	8.56	9.93	9.00	7.56	8.45

Table 2: Effect of different green manure crops and nutrient management treatments on number of tubers per plant of potato

Treatment	Number of tubers per plant		
	2018-19	2019-20	Pooled
(G): Main plot: Green manure crops (*kharif* season)			
G_1: Sunnhemp	9.26	9.38	9.32
G_2: Cowpea	8.51	8.55	8.53
G_3: Cluster bean	8.21	8.29	8.25
S.Em.±	0.19	0.20	0.13
C.D. at 5%	0.65	0.69	0.39
C.V.%	10.55	11.24	9.99
(N): Sub plot: Nutrient management treatments to potato crop (*rabi* season)			
N_1: 100% RDF + FYM @ 25 t/ha	9.38	9.37	9.38
N_2: 100% RDF + FYM @ 12.5 t/ha	8.78	8.75	8.77
N_3: 100% RDF	8.48	8.63	8.55
N_4: 75% RDF + FYM @ 25 t/ha	9.07	9.08	9.08
N_5: 75% RDF + FYM @ 12.5 t/ha	8.28	8.48	8.38
N_6: 75% RDF	7.97	8.11	8.04
S.Em.±	0.18	0.15	0.12
C.D. at 5%	0.50	0.42	0.33
Interaction (G×N)			
S.Em.±	0.30	0.26	0.21
C.D. at 5%	Sig.	Sig.	Sig.
C.V.%	7.04	5.89	6.68

Table 2.1: Interaction effect of different green manure crops and nutrient management treatments on number of tubers per plant of potato (2018-19, 2019-20 and pooled)

Green manure crops	Nutrient management					
	N_1	**N_2**	N_3	N_4	N_5	N_6
2018-19						
G_1	10.00	9.95	8.75	9.90	8.90	8.05
G_2	9.65	8.20	8.20	9.10	7.90	8.00
G_3	8.50	8.20	8.45	8.20	8.05	7.85
S.Em.±	0.30					
C.D. at 5%	0.87					
2019-20						
G_1	9.95	9.95	9.05	9.90	9.15	8.25
G_2	9.55	8.10	8.30	9.15	8.05	8.13
G_3	8.60	8.20	8.55	8.20	8.25	7.95
S.Em.±	0.26					
C.D. at 5%	0.73					
Pooled						
G_1	9.98	9.95	8.90	9.90	9.03	8.15
G_2	9.60	8.15	8.25	9.13	7.98	8.06
G_3	8.55	8.20	8.50	8.20	8.15	7.90
S.Em.±	0.21					
C.D. at 5%	0.58					

Table 3: Effect of different green manure crops and nutrient management treatments on dry weight of shoots per plant of potato at harvest

Treatment	Dry weight of shoots per plant (g)		
	2018-19	2019-20	Pooled
(G): Main plot: Green manure crops (*kharif* season)			
G_1: Sunnhemp	31.63	31.19	31.41
G_2: Cowpea	27.15	27.37	27.26
G_3: Cluster bean	26.72	27.36	27.04
S.Em.±	0.74	0.81	0.53
C.D. at 5%	2.57	2.80	1.63
C.V.%	12.77	13.85	12.86
(N): Sub plot: Nutrient management treatments to potato crop (*rabi* season)			
N_1: 100% RDF + FYM @ 25 t/ha	30.26	30.64	30.45
N_2: 100% RDF + FYM @ 12.5 t/ha	29.22	29.25	29.23
N_3: 100% RDF	27.85	27.41	27.63
N_4: 75% RDF + FYM @ 25 t/ha	29.61	29.62	29.62
N_5: 75% RDF + FYM @ 12.5 t/ha	27.46	28.15	27.81
N_6: 75% RDF	26.61	26.77	26.69
S.Em.±	0.73	0.60	0.48
C.D. at 5%	2.07	1.71	1.34
C.V.%	8.84	7.25	8.18

Table 4: Effect of different green manure crops and nutrient management treatments on dry weight of tubers per plant of potato at harvest

Treatment	Dry weight of tubers per plant (g)		
	2018-19	2019-20	Pooled
(G): Main plot: Green manure crops (*kharif* season)			
G_1: Sunnhemp	115.82	119.02	117.42
G_2: Cowpea	106.00	106.38	106.19
G_3: Cluster bean	102.36	101.37	101.86
S.Em.±	2.59	2.35	1.73
C.D. at 5%	8.96	8.15	5.33
C.V.%	11.75	10.59	11.04
(N): Sub plot: Nutrient management treatments to potato crop (*rabi* season)			
N_1: 100% RDF + FYM @ 25 t/ha	115.25	116.32	115.78
N_2: 100% RDF + FYM @ 12.5 t/ha	112.44	112.50	112.47
N_3: 100% RDF	104.32	108.25	106.28
N_4: 75% RDF + FYM @ 25 t/ha	113.65	114.86	114.25
N_5: 75% RDF + FYM @ 12.5 t/ha	103.18	100.45	101.82
N_6: 75% RDF	99.52	101.16	100.34
S.Em.±	3.41	2.62	2.15
C.D. at 5%	9.71	7.45	6.05
C.V.%	10.93	8.32	9.72

Table 5: Effect of different green manure crops and nutrient management treatments on total tuber yield of potato

Treatment	Total tuber yield (t/ha)		
	2018-19	2019-20	Pooled
(G): Main plot: Green manure crops (*kharif* season)			
G_1: Sunnhemp	44.58	45.38	44.98
G_2: Cowpea	41.21	41.56	41.38
G_3: Cluster bean	39.75	40.06	39.90
S.Em.±	0.90	1.01	0.61
C.D. at 5%	3.13	3.50	1.89
C.V.%	10.59	11.71	10.12
(N): Sub plot: Nutrient management treatments to potato crop (*rabi* season)			
N_1: 100% RDF + FYM @ 25 t/ha	44.80	44.98	44.89
N_2: 100% RDF + FYM @ 12.5 t/ha	43.04	43.36	43.20
N_3: 100% RDF	41.18	42.00	41.59
N_4: 75% RDF + FYM @ 25 t/ha	43.47	43.75	43.61
N_5: 75% RDF + FYM @ 12.5 t/ha	40.13	40.93	40.53
N_6: 75% RDF	38.45	38.99	38.72
S.Em.±	0.90	0.79	0.62
C.D. at 5%	2.56	2.24	1.73
Interaction (G×N)			
S.Em.±	1.56	1.36	1.07
C.D. at 5%	Sig.	Sig.	Sig.
C.V.%	7.44	6.44	7.16

Table 5.1: Interaction effect of different green manure crops and nutrient management treatments on total tuber yield (t/ha) of potato (2018-19, 2019-20 and pooled)

Green manure crops	Nutrient management					
	N_1	N_2	N_3	N_4	N_5	N_6
2018-19						
G_1	48.71	46.99	42.34	47.63	43.33	38.45
G_2	45.92	40.88	39.69	43.88	38.08	38.82
G_3	39.77	41.25	41.52	38.91	39.00	38.07
S.Em.±	1.56					
C.D. at 5%	4.43					
2019-20						
G_1	48.88	47.39	43.77	47.93	44.48	39.85
G_2	45.69	41.17	40.30	44.31	38.73	39.18
G_3	40.39	41.51	41.93	39.01	39.57	37.93
S.Em.±	1.36					
C.D. at 5%	3.88					
Pooled						
G_1	48.80	47.19	43.05	47.78	43.91	39.15
G_2	45.81	41.03	39.99	44.09	38.39	39.00
G_3	40.08	41.38	41.72	38.96	39.28	38.00
S.Em.±	1.07					
C.D. at 5%	2.99					

Table 6: Effect of different green manure crops and nutrient management treatments on haulm yield of potato

Treatment	Haulm yield (q/ha)		
	2018-19	2019-20	Pooled
(G): Main plot: Green manure crops (*kharif* season)			
G_1: Sunnhemp	30.68	31.78	31.23
G_2: Cowpea	28.04	28.82	28.43
G_3: Cluster bean	26.98	27.82	27.40
S.Em.±	0.70	0.76	0.44
C.D. at 5%	2.41	2.61	1.37
C.V.%	11.96	12.55	10.62
(N): Sub plot: Nutrient management treatments to potato crop (*rabi* season)			
N_1: 100% RDF + FYM @ 25 t/ha	30.25	31.24	30.75
N_2: 100% RDF + FYM @ 12.5 t/ha	29.21	29.86	29.53
N_3: 100% RDF	28.37	29.07	28.72
N_4: 75% RDF + FYM @ 25 t/ha	29.59	30.22	29.90
N_5: 75% RDF + FYM @ 12.5 t/ha	27.40	28.72	28.06
N_6: 75% RDF	26.61	27.73	27.17
S.Em.±	0.66	0.53	0.44
C.D. at 5%	1.87	1.51	1.24
C.V.%	7.94	6.23	7.46

Conclusion

For optimal potato cultivation, the integration of sunnhemp as a green manure crop, coupled with 100% RDF + FYM 25 t/ha, consistently demonstrated superior results across various growth parameters and total tuber yield.

Balanced nutrient management practices, incorporating both organic and inorganic sources, played a pivotal role in enhancing plant growth, tuber development, and overall crop performance.

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