

Original Research Article

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## Effect of Site Specific Nutrient Management (SSNM) on Growth Parameters of Soybean (*Glycine max* (L.) Merrill) and Chickpea (*Cicer arietinum* L.) under Soybean-Chickpea Cropping System

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### ABSTRACT

#### Keywords

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A field experiment was conducted during 2017-18 and 2018-19 at Research cum Instructional Farm, IGKV, Raipur, (C.G.) to find out the effect of site specific nutrient management (SSNM) on growth parameters of soybean and its residual effect on chickpea under soybean-chickpea cropping system. It was revealed that application of site specific nutrient management (SSNM) treatment in soybean and residual effect of site specific nutrient management (SSNM) with direct treated treatment in chickpea crop gave significantly higher plant height, number of primary branches, number of leaves, leaf area, leaf area index (LAI) and dry matter accumulation as compared to other treatment, during both the years of experimentation and their mean. Significantly the lowest value of respective parameters was found under treatment T7 (Absolute control).

### Introduction

Pulses are very important for sustainable agriculture because of the unique capacity of fixing the atmospheric nitrogen by various microbial effects and they are plays a vital role for improving soil fertility and productivity. Pulses have the capacity to withstand in the various cropping systems without disturbing the main cereal or oilseed crops. Soybean-chickpea cropping system is the most important cropping system following in

Madhya Pradesh and Chhattisgarh. In Chhattisgarh after rice based cropping system, the most accepted cropping system is soybean based cropping system and followed by many farmer's especially in Durg, Bemetara, Rajnandgaon, Mungeli and Kawardha district.

The concept of SSNM may not be new, but now we have new technology to use them more efficiently (Tiwari and Gill, 2007). Site-specific nutrient management (SSNM) is a plant-based approach for managing the

nutrients needs of crops in intensive crop production systems. It provides principles and tools for feeding nutrients and when needed to achieve higher yields while optimizing use of nutrients from indigenous source. Nutrient management is a major tool of a sustainable soil and crop management system. Knowing the requirement of nutrients for all growth stages of crop and understanding the ability of soil to supply those nutrients is very important to profitable crop production. Site specific nutrient management (SSNM) is following those concepts to areas within a field that are required different management practices.

### **Materials and Methods**

The present investigation was carried out for two consecutive years in *kharif* and *rabi* seasons of 2017-18 and 2018-19 at Research Cum Instructional Farm of the Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. Treatment for *kharif* experiment on soybean comprised with eight different levels of nutrients viz. T1-SSNM based recommendation through nutrient expert for 4 t ha<sup>-1</sup> yield, T2-N omission, T3-P omission, T4-K omission, T5-RDF, T6-Farmer's practice, T7-absolute control and T8-STCR based recommendation under randomized complete block design (RBD) with three replications and for *rabi* season, chickpea was taken and treatment was consisted of 8 main factor (Residual effects of *kharif* crop) and 2 sub factor (Direct effect) were tested under factorial randomized complete block design with three replications. During *kharif* season of 2017 and 2018, soybean variety JS-97-52 was sown on 27<sup>th</sup> and 29<sup>th</sup> June, respectively. Whereas, chickpea variety JG-130 (Jawahar Gram-130) was sown on 22<sup>th</sup> and 20<sup>th</sup> November, during *rabi* seasons of 2017-18 and 2018-19, respectively. The soil was clayey (*Vertisols*) in texture, neutral in soil reaction (pH) with low N (218.60), medium P (19.84) and medium K (337.62). All growth

parameters *i.e.* plant height, number of primary branches plant<sup>-1</sup>, number of leaves plant<sup>-1</sup>, leaf area, LAI and dry matter accumulation were taken by using five plant samples as per standard procedures and the data was analyzed with a standard statistical design (Table 1–23).

### **Results and Discussion**

#### **Effect on plant height (cm)**

Plant height of soybean and chickpea under investigation was recorded at 30, 60, 90 DAS and at harvest. In general, it was found that plant height was linearly increased up to 90 DAS (up to physiological maturity) and at harvest it was decreased. The plant height of soybean and chickpea at various growth stages varied significantly due to levels of nutrients and its residual effects, during both the years of experiment.

In soybean crop, at 30 DAS, maximum plant height (36.67 and 39.28 cm) was recorded under the treatment T1 (SSNM) during both the years of investigation and both the year of mean. The lowest plant height (29.65 and 30 cm) was found under the treatment T7 (Absolute control) during both the years of experiment and their mean but it was found non-significant in both the years. At 60, 90 DAS and at harvest, significantly maximum plant height was observed under T1 (SSNM) during both the years of investigation and in their mean. However, it was found at par with T8 (STCR), T5 (RDF) and T6 (Farmer's practices) at 60 and 90 DAS and with T8 (STCR), T5 (RDF), T6 (Farmer's practices) and T2 (N Omission) at harvest, respectively, during both the years of experimentation and their mean. Significantly the lowest plant height was recorded under the treatment T7 (Absolute control) at 60, 90 DAS and at harvest during both the years of testing and their mean.

The presented data indicated that significantly maximum plant height of chickpea was found under the treatment RT1 (SSNM) during both the years of experiment and in their mean at all the stages of crop observations *i.e.* 30, 60, 90 DAS and at harvest. However, it was found at par with treatment RT8 (STCR), RT5 (RDF) and RT6 (Farmer's practices) at 30 and 60 DAS and with treatment RT8 (STCR), RT5 (RDF), RT6 (Farmer's practices) and RT2 (N Omission) at 90 DAS and at harvest during both the years of field experiment and in their mean.

Significantly minimum plant height of chickpea was recorded under RT7 (Absolute control), concerning to direct application of nutrient to chickpea crop and control plot during both the years and in their mean data at all the stages.

Significantly highest plant height of chickpea recorded under direct application of nutrient as compared to control plot. Interaction effect of residual and direct application was found non-significant during both the years of field study and their average at all the stages of crop study.

The flexible nitrogen management strategies that permitted for maintaining the amount of nitrogen according to plant needs as well as the application of sufficient amount of phosphorus and potassium are overcomes the deficiencies and maintaining soil fertility. This may lead to a higher balanced NPK nutrition in the SSNM treatment resulting in higher vigorous plant growth. Similar result was also found by Pasuquin *et al.*, (2014).

### **Effect on number of branches plant<sup>-1</sup>**

The data on number of branches plant<sup>-1</sup> of soybean and chickpea under investigation was recorded at 30, 60, 90 DAS and at harvest. It is clear from the data that appearances of new

branches were continue up to 90 DAS (physiological maturity) and found very rare fluctuation between 90 DAS and at harvest.

In soybean, at 30 DAS maximum number of branches (3.22 and 3.33) was recorded under the treatment T1 (SSNM) during both the years of experimentation and in their mean but it was found non-significant. The fewer number of branches was found under the treatment T7 (Absolute control) during both the years of experimentation and their mean. At 60, 90 DAS, and at harvest, significantly the highest number of branches plant<sup>-1</sup> was observed under T1 (SSNM) *viz.* 6.07, 7.17 and 7.00 during 2017 and 6.33, 7.77 and 7.70 during 2018, respectively. However, it was at par with T8 (STCR) and T5 (RDF) during 2017 and only T8 during 2018 and when averaged at 60, 90 DAS and at harvest, respectively, during both the years of experimentation. Significantly the least number of primary branches plant<sup>-1</sup> was reported under the treatment T7 (Absolute control) at 60, 90 DAS and at harvest during both the years of investigation and in their average.

The data shows that significantly highest number of branches plant<sup>-1</sup> of chickpea was observed under the treatment RT1 (SSNM) during both the years of field experiment and in their mean at all the stages of crop study (30, 60, 90 DAS and at harvest). However, at 30 DAS and at harvest stage, it was statistically comparable with treatment RT8 (STCR) except at harvest stage during 2018-19 because it was also found at par with RT5 (RDF). At 60 DAS, the maximum value was also statistically at par with RT8 (STCR), RT5 (RDF) and RT6 (Farmer's practices) and at 90 DAS with RT8 (STCR) and RT5 (RDF), respectively. The treatment RT7 (Absolute control) gave significantly least number of branches plant<sup>-1</sup> of chickpea during both the years of investigation and in their mean at all

the stages. Under the direct application of nutrient significantly higher number of branches plant<sup>-1</sup> were recorded as compared to control plot. Higher number of branches plant<sup>-1</sup>, might be due to lower inter-nodal elongation with increasing the nutrient use efficiency of applied nutrients and supply it constantly to the plant throughout the growth period of crop and incensing various physiological activities in plant which are believed that necessary for proper plant growth and development.

### **Effect on leaf area (cm<sup>2</sup> plant<sup>-1</sup>)**

In soybean at 30, 60 and 90 DAS, significantly highest leaf area (cm<sup>2</sup> plant<sup>-1</sup>) was recorded under T1 (SSNM) viz. 336, 718 and 821 during 2017 and 339, 722 and 835 during 2018, respectively. However, at 30 DAS, it was found at par with all the treatment except T3 (P Omission) and T7 (Absolute control) during both the years of experiment and at latter stage it was at par with T8 (STCR), T5 (RDF) and T6 (Farmer's practices) during both the years of testing and their mean. Significantly the lowest leaf area (293, 624 and 652 during 2017 and 296, 625 and 660 during 2018, respectively) at all the stages was recorded under the treatment T7 (Absolute control) during both the years of study and their average. Similar results are also reported by Yagoub *et al.*, (2015) who reported that fertilizers treatments had causes significant differences on leaf area at 45 and 60 days.

The data reveals that significantly highest leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of chickpea was recorded under the treatment RT1 (SSNM) during both the years of field experiment and in their mean data at all the stages of crop study viz. 30, 60 and 90 DAS. However, at 30 DAS, it was statistically comparable with treatment RT8 (STCR) during both the years and their mean. At 60 DAS and at 90 DAS, the maximum

value was at par with RT8 (STCR), RT5 (RDF) and RT6 (Farmer's practices) and with RT8 (STCR) and RT5 (RDF), respectively during both the years of investigation and in their average. Significantly minimum leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of chickpea was found under the treatment RT7 (Absolute control), concerning to direct application of nutrient to chickpea crop and control plot, during both the years and in their average data at all the stages. The data reveals that leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of chickpea was maximum under direct application of nutrient as compared to untreated control plot.

### **Effect on leaf area index (LAI)**

Leaf area index (LAI) is determine of leafiness per unit ground area and denotes the degree of photosynthetic technology. The data proved that the leaf area index at various growth stages was significantly influenced due to difference of the levels of nutrients during both the years of testing. Leaf area index of soybean followed a sigmoid pattern with respect to time and increased up to 90 DAS but the degree of increasing was slow between at 60 DAS to 90 DAS.

Significantly maximum leaf area index of soybean at 30, 60 and 90 DAS was reported under T1 (SSNM). However, it was found at par with all the treatment except T3 (P Omission) and T7 (Absolute control) during both the years of experiment and in their mean. At 60 and 90 DAS, it was found at par with T8 (STCR), T5 (RDF) and T6 (Farmer's practices) during both the years of testing and their average. Significantly the least leaf area index (0.98, 2.08 and 2.17 during 2017 and 0.99, 2.08 and 2.20 during 2018, respectively) at all the stages was reported under the treatment T7 (Absolute control) during both the years of investigation and their mean.

**Table.1** Effect of SSNM based fertilizer application on plant height of soybean under soybean-chickpea cropping system

Treatment	Plant height											
	30 DAS			60 DAS			90 DAS			At harvest		
	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
<b>T1- SSNM</b>	36.67	39.28	37.97	76.33	78.00	77.17	87.41	89.67	88.54	84.44	85.43	84.94
<b>T2- N Omission</b>	33.14	34.54	33.84	70.00	71.33	70.67	81.67	83.33	82.50	79.61	81.43	80.52
<b>T3- P Omission</b>	31.54	32.54	32.04	67.67	69.33	68.50	78.33	79.33	78.83	77.37	78.07	77.72
<b>T4- K Omission</b>	32.60	33.27	32.94	68.67	70.00	69.33	80.67	81.67	81.17	79.22	79.41	79.31
<b>T5- RDF</b>	35.71	37.43	36.57	73.67	76.00	74.83	85.00	87.33	86.17	82.34	83.33	82.84
<b>T6- Farmer's practices</b>	35.39	36.62	36.01	73.00	74.67	73.83	84.19	85.67	84.93	81.57	82.50	82.04
<b>T7- Absolute control</b>	29.65	30.00	29.82	64.00	66.67	65.33	74.67	73.00	73.83	73.42	71.89	72.66
<b>T8- STCR</b>	36.17	38.67	37.42	75.89	77.22	76.55	86.26	88.33	87.30	83.64	84.70	84.17
<b>SEm±</b>	<b>1.58</b>	<b>2.19</b>	<b>1.89</b>	<b>1.38</b>	<b>1.47</b>	<b>1.42</b>	<b>1.59</b>	<b>1.58</b>	<b>1.59</b>	<b>1.69</b>	<b>1.48</b>	<b>1.6</b>
<b>CD (P=0.05)</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>4.17</b>	<b>4.46</b>	<b>4.32</b>	<b>4.83</b>	<b>4.80</b>	<b>4.82</b>	<b>5.11</b>	<b>4.49</b>	<b>4.8</b>

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.2** Effect of SSNM based fertilizer application on number of branches plant<sup>-1</sup> of soybean under soybean-chickpea cropping system

Treatment	Number of branches plant <sup>-1</sup>											
	30 DAS			60 DAS			90 DAS			At harvest		
	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
<b>T1- SSNM</b>	3.22	3.33	3.27	6.07	6.33	6.20	7.17	7.77	7.47	7.00	7.70	7.35
<b>T2- N Omission</b>	2.60	2.73	2.67	4.33	4.57	4.45	5.00	5.37	5.18	4.89	5.20	5.04
<b>T3- P Omission</b>	2.27	2.43	2.35	4.00	4.11	4.06	4.44	4.60	4.52	4.44	4.60	4.52
<b>T4- K Omission</b>	2.40	2.57	2.48	4.17	4.50	4.33	4.77	4.87	4.82	4.67	5.00	4.83
<b>T5- RDF</b>	2.89	3.00	2.94	5.11	5.28	5.19	5.78	6.33	6.06	5.78	6.40	6.09
<b>T6- Farmer's practices</b>	2.69	2.82	2.75	4.78	5.00	4.89	5.33	5.80	5.57	5.44	5.80	5.62
<b>T7- Absolute control</b>	2.13	2.40	2.26	3.57	3.78	3.67	4.00	4.00	4.00	4.11	4.20	4.16
<b>T8- STCR</b>	3.00	3.20	3.10	5.67	5.93	5.80	6.73	7.20	6.97	6.60	7.12	6.86
<b>SEm±</b>	<b>0.25</b>	<b>0.29</b>	<b>0.27</b>	<b>0.34</b>	<b>0.27</b>	<b>0.31</b>	<b>0.52</b>	<b>0.21</b>	<b>0.37</b>	<b>0.46</b>	<b>0.21</b>	<b>0.34</b>
<b>CD (P=0.05)</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>1.03</b>	<b>0.83</b>	<b>0.93</b>	<b>1.58</b>	<b>0.65</b>	<b>1.11</b>	<b>1.40</b>	<b>0.63</b>	<b>1.02</b>

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>



**Table.3** Effect of SSNM based fertilizer application on leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of soybean under soybean-chickpea cropping system

Treatment	Leaf area (cm <sup>2</sup> plant <sup>-1</sup> )								
	30 DAS			60 DAS			90 DAS		
	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
<b>T1- SSNM</b>	336	339	338	718	722	720	821	835	828
<b>T2- N Omission</b>	317	320	318	665	667	666	737	743	740
<b>T3- P Omission</b>	308	312	310	640	644	642	687	693	690
<b>T4- K Omission</b>	313	320	316	651	655	653	712	722	717
<b>T5- RDF</b>	326	329	328	689	686	688	764	780	772
<b>T6- Farmer's practices</b>	323	326	325	681	682	681	755	762	759
<b>T7- Absolute control</b>	293	296	294	624	625	624	652	660	656
<b>T8- STCR</b>	333	335	334	703	706	705	811	819	815
<b>SEm±</b>	<b>8.37</b>	<b>7.96</b>	<b>8.17</b>	<b>17.50</b>	<b>17.00</b>	<b>17.25</b>	<b>23.97</b>	<b>24.25</b>	<b>24.11</b>
<b>CD (P=0.05)</b>	<b>25.40</b>	<b>24.15</b>	<b>24.78</b>	<b>53.09</b>	<b>51.56</b>	<b>52.32</b>	<b>72.69</b>	<b>73.57</b>	<b>73.13</b>

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.4** Effect of SSNM based fertilizer application on leaf area index (plant<sup>-1</sup>) of soybean under soybean-chickpea cropping system

Treatment	Leaf area index (plant <sup>-1</sup> )								
	30 DAS			60 DAS			90 DAS		
	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
<b>T1- SSNM</b>	1.12	1.13	1.13	2.39	2.41	2.40	2.74	2.78	2.76
<b>T2- N Omission</b>	1.06	1.07	1.06	2.22	2.22	2.22	2.46	2.48	2.47
<b>T3- P Omission</b>	1.03	1.04	1.03	2.13	2.15	2.14	2.29	2.31	2.30
<b>T4- K Omission</b>	1.04	1.07	1.05	2.17	2.18	2.18	2.37	2.41	2.39
<b>T5- RDF</b>	1.09	1.10	1.09	2.30	2.29	2.29	2.55	2.60	2.57
<b>T6- Farmer's practices</b>	1.08	1.09	1.08	2.27	2.27	2.27	2.52	2.54	2.53
<b>T7- Absolute control</b>	0.98	0.99	0.98	2.08	2.08	2.08	2.17	2.20	2.19
<b>T8- STCR</b>	1.11	1.12	1.11	2.34	2.35	2.35	2.70	2.73	2.72
<b>SEm±</b>	<b>0.03</b>	<b>0.03</b>	<b>0.03</b>	<b>0.06</b>	<b>0.06</b>	<b>0.06</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>
<b>CD (P=0.05)</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.18</b>	<b>0.17</b>	<b>0.17</b>	<b>0.24</b>	<b>0.25</b>	<b>0.24</b>

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.5** Effect of SSNM based fertilizer application on dry matter accumulation (g plant<sup>-1</sup>) of soybean under soybean-chickpea cropping system

Treatment	Dry matter accumulation (g plant <sup>-1</sup> )											
	30 DAS			60 DAS			90 DAS			At harvest		
	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean	2017	2018	Mean
<b>T1- SSNM</b>	0.86	0.93	0.89	25.29	28.41	26.85	51.00	52.33	51.67	58.33	58.00	58.17
<b>T2- N Omission</b>	0.79	0.82	0.81	21.04	22.71	21.88	40.34	41.88	41.11	45.67	46.67	46.17
<b>T3- P Omission</b>	0.76	0.77	0.77	18.36	20.07	19.22	36.23	37.94	37.09	41.13	40.00	40.57
<b>T4- K Omission</b>	0.78	0.80	0.79	19.33	20.61	19.97	39.23	40.32	39.78	43.33	45.00	44.17
<b>T5- RDF</b>	0.82	0.87	0.85	22.41	24.52	23.47	45.25	44.92	45.09	52.67	54.00	53.33
<b>T6- Farmer's practices</b>	0.81	0.84	0.82	22.37	23.67	23.02	43.64	43.97	43.80	49.66	50.33	50.00
<b>T7- Absolute control</b>	0.70	0.72	0.71	17.40	18.46	17.93	33.44	34.38	33.91	36.67	37.33	37.00
<b>T8- STCR</b>	0.85	0.91	0.88	25.13	26.51	25.82	48.67	50.37	49.52	55.37	56.10	55.73
<b>SEm±</b>	<b>0.03</b>	<b>0.07</b>	<b>0.05</b>	<b>0.69</b>	<b>0.74</b>	<b>0.71</b>	<b>0.80</b>	<b>1.55</b>	<b>1.18</b>	<b>1.36</b>	<b>1.11</b>	<b>1.24</b>
<b>CD (P=0.05)</b>	<b>NS</b>	<b>NS</b>	<b>NS</b>	<b>2.08</b>	<b>2.24</b>	<b>2.16</b>	<b>2.43</b>	<b>4.69</b>	<b>3.56</b>	<b>4.14</b>	<b>3.37</b>	<b>3.75</b>

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>



**Table.6** Direct and residual effect of SSNM based fertilizer application on plant height (cm) of chickpea at 30 DAS under soybean-chickpea cropping system

Treatment	Plant height (cm)								
	30 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	21.22	15.60	18.41	22.33	15.95	19.14	21.78	15.78	18.78
<b>RT2- N Omission</b>	17.37	14.78	16.07	17.67	14.94	16.30	17.52	14.86	16.19
<b>RT3- P Omission</b>	16.34	14.38	15.36	16.78	14.15	15.47	16.56	14.27	15.41
<b>RT4- K Omission</b>	16.88	14.01	15.45	17.42	14.56	15.99	17.15	14.29	15.72
<b>RT5- RDF</b>	19.50	15.24	17.37	20.17	15.50	17.83	19.83	15.37	17.60
<b>RT6- Farmer's practices</b>	18.17	15.00	16.58	19.17	15.17	17.17	18.67	15.08	16.87
<b>RT7- Absolute control</b>	15.97	11.33	13.65	16.46	10.67	13.56	16.21	11.00	13.61
<b>RT8- STCR</b>	20.67	15.47	18.07	21.98	15.67	18.83	21.33	15.57	18.45
<b>Mean</b>	18.26	14.48		19.00	14.58		18.63	14.53	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.76</b>	<b>2.20</b>		<b>0.81</b>	<b>2.34</b>		<b>0.71</b>	<b>2.06</b>	
<b>Direct effect</b>	<b>0.38</b>	<b>1.10</b>		<b>0.41</b>	<b>1.17</b>		<b>0.36</b>	<b>1.03</b>	
<b>Interaction</b>	<b>1.08</b>	<b>NS</b>		<b>1.15</b>	<b>NS</b>		<b>1.01</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.7** Direct and residual effect of SSNM based fertilizer application on plant height (cm) of chickpea at 60 DAS under soybean-chickpea cropping system

Treatment	Plant height (cm)								
	60 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	43.32	38.44	40.88	43.49	38.57	41.03	43.41	38.51	40.96
<b>RT2- N Omission</b>	41.13	34.85	37.99	41.22	35.04	38.13	41.18	34.94	38.06
<b>RT3- P Omission</b>	39.91	34.04	36.98	40.04	33.93	36.99	39.97	33.99	36.98
<b>RT4- K Omission</b>	40.60	33.82	37.21	40.81	34.21	37.51	40.71	34.01	37.36
<b>RT5- RDF</b>	42.10	36.83	39.47	42.20	36.91	39.56	42.15	36.87	39.51
<b>RT6- Farmer's practices</b>	41.67	35.50	38.58	41.73	35.59	38.66	41.70	35.54	38.62
<b>RT7- Absolute control</b>	39.45	29.67	34.56	39.67	29.51	34.59	39.56	29.59	34.58
<b>RT8- STCR</b>	42.82	38.80	40.81	43.11	38.83	40.97	42.97	38.81	40.89
<b>Mean</b>	41.38	35.24		41.53	35.32		41.45	35.28	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.82</b>	<b>2.37</b>		<b>0.89</b>	<b>2.56</b>		<b>0.83</b>	<b>2.41</b>	
<b>Direct effect</b>	<b>0.41</b>	<b>1.19</b>		<b>0.44</b>	<b>1.28</b>		<b>0.42</b>	<b>1.21</b>	
<b>Interaction</b>	<b>1.16</b>	<b>NS</b>		<b>1.25</b>	<b>NS</b>		<b>1.18</b>	<b>NS</b>	

**Table.8** Direct and residual effect of SSNM based fertilizer application on plant height (cm) of chickpea at 90 DAS under soybean-chickpea cropping system

Treatment	Plant height (cm)								
	90 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	55.78	44.67	50.23	56.12	44.93	50.53	55.95	44.80	50.38
<b>RT2- N Omission</b>	50.11	42.76	46.43	50.24	42.89	46.57	50.18	42.82	46.50
<b>RT3- P Omission</b>	48.83	41.18	45.00	48.93	41.12	45.03	48.88	41.15	45.01
<b>RT4- K Omission</b>	49.67	41.05	45.36	49.73	41.28	45.51	49.70	41.16	45.43
<b>RT5- RDF</b>	52.73	44.26	48.50	53.00	44.46	48.73	52.87	44.36	48.61
<b>RT6- Farmer's practices</b>	52.33	43.47	47.90	52.53	43.63	48.08	52.43	43.55	47.99
<b>RT7- Absolute control</b>	46.67	38.45	42.56	46.77	38.39	42.58	46.72	38.42	42.57
<b>RT8- STCR</b>	53.15	45.00	49.08	53.48	45.30	49.39	53.32	45.15	49.23
<b>Mean</b>	51.16	42.60		51.35	42.75		51.26	42.68	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>1.54</b>	<b>4.45</b>		<b>1.58</b>	<b>4.57</b>		<b>1.42</b>	<b>4.10</b>	
<b>Direct effect</b>	<b>0.77</b>	<b>2.22</b>		<b>0.79</b>	<b>2.29</b>		<b>0.71</b>	<b>2.05</b>	
<b>Interaction</b>	<b>2.18</b>	<b>NS</b>		<b>2.24</b>	<b>NS</b>		<b>2.01</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPkS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kgNPKha<sup>-1</sup>

**Table.9** Direct and residual effect of SSNM based fertilizer application on plant height (cm) of chickpea at harvest under soybean-chickpea cropping system

Treatment	Plant height (cm)								
	At harvest								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	49.49	42.89	46.19	51.38	42.93	47.16	50.44	42.91	46.67
<b>RT2- N Omission</b>	46.68	41.08	43.88	46.77	41.17	43.97	46.73	41.13	43.93
<b>RT3- P Omission</b>	44.90	40.53	42.71	45.00	40.26	42.63	44.95	40.40	42.67
<b>RT4- K Omission</b>	46.04	40.21	43.12	46.12	40.59	43.35	46.08	40.40	43.24
<b>RT5- RDF</b>	48.08	42.13	45.11	48.21	42.17	45.19	48.14	42.15	45.15
<b>RT6- Farmer's practices</b>	47.40	41.67	44.54	47.54	41.74	44.64	47.47	41.71	44.59
<b>RT7- Absolute control</b>	44.04	36.12	40.08	44.12	35.41	39.77	44.08	35.77	39.92
<b>RT8- STCR</b>	48.83	43.13	45.98	49.16	43.20	46.18	49.00	43.17	46.08
<b>Mean</b>	46.93	40.97		47.29	40.93		47.11	40.95	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>1.12</b>	<b>3.24</b>		<b>1.20</b>	<b>3.45</b>		<b>1.13</b>	<b>3.26</b>	
<b>Direct effect</b>	<b>0.56</b>	<b>1.62</b>		<b>0.60</b>	<b>1.73</b>		<b>0.56</b>	<b>1.63</b>	
<b>Interaction</b>	<b>1.59</b>	<b>NS</b>		<b>1.69</b>	<b>NS</b>		<b>1.60</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.10** Direct and residual effect of SSNM based fertilizer application on number of branches (plant<sup>-1</sup>) of chickpea at 30 DAS under soybean-chickpea cropping system

Treatment	Number of branches (plant <sup>-1</sup> )								
	30 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	5.86	3.61	4.74	6.13	3.79	4.96	6.00	3.70	4.85
<b>RT2- N Omission</b>	4.76	2.91	3.84	5.13	3.08	4.11	4.95	3.00	3.97
<b>RT3- P Omission</b>	4.38	2.80	3.59	4.88	2.76	3.82	4.63	2.78	3.71
<b>RT4- K Omission</b>	4.60	2.69	3.65	5.01	2.91	3.96	4.81	2.80	3.80
<b>RT5- RDF</b>	5.29	3.42	4.36	5.60	3.56	4.58	5.45	3.49	4.47
<b>RT6- Farmer's practices</b>	5.14	3.10	4.12	5.44	3.22	4.33	5.29	3.16	4.23
<b>RT7- Absolute control</b>	4.06	2.24	3.15	4.21	2.13	3.17	4.14	2.19	3.16
<b>RT8- STCR</b>	5.51	3.70	4.61	5.85	3.89	4.87	5.68	3.79	4.74
<b>Mean</b>	4.95	3.06		5.28	3.17		5.12	3.11	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.10</b>	<b>0.29</b>		<b>0.11</b>	<b>0.33</b>		<b>0.10</b>	<b>0.30</b>	
<b>Direct effect</b>	<b>0.05</b>	<b>0.14</b>		<b>0.06</b>	<b>0.16</b>		<b>0.05</b>	<b>0.15</b>	
<b>Interaction</b>	<b>0.14</b>	<b>NS</b>		<b>0.16</b>	<b>NS</b>		<b>0.15</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.11** Direct and residual effect of SSNM based fertilizer application on number of branches (plant<sup>-1</sup>) of chickpea at 60 DAS under soybean-chickpea cropping system

Treatment	Number of branches (plant <sup>-1</sup> )								
	60 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	28.78	22.63	25.71	30.00	22.77	26.38	29.39	22.70	26.05
<b>RT2- N Omission</b>	26.09	20.71	23.40	26.89	20.78	23.83	26.49	20.74	23.62
<b>RT3- P Omission</b>	24.88	19.52	22.20	25.50	19.60	22.55	25.19	19.56	22.38
<b>RT4- K Omission</b>	25.50	19.02	22.26	26.13	19.94	23.04	25.82	19.48	22.65
<b>RT5- RDF</b>	27.79	22.15	24.97	28.00	22.25	25.12	27.89	22.20	25.04
<b>RT6- Farmer's practices</b>	27.43	21.69	24.56	27.21	21.93	24.57	27.32	21.81	24.57
<b>RT7- Absolute control</b>	23.81	15.48	19.64	24.00	15.20	19.60	23.91	15.34	19.62
<b>RT8- STCR</b>	28.07	22.93	25.50	29.10	23.04	26.07	28.58	22.99	25.78
<b>Mean</b>	26.54	20.51		27.10	20.69		26.82	20.60	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.64</b>	<b>1.84</b>		<b>0.73</b>	<b>2.10</b>		<b>0.61</b>	<b>1.78</b>	
<b>Direct effect</b>	<b>0.32</b>	<b>0.92</b>		<b>0.36</b>	<b>1.05</b>		<b>0.31</b>	<b>0.89</b>	
<b>Interaction</b>	<b>0.90</b>	<b>NS</b>		<b>1.03</b>	<b>NS</b>		<b>0.87</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.12** Direct and residual effect of SSNM based fertilizer application on number of branches (plant<sup>-1</sup>) of chickpea at 90 DAS under soybean-chickpea cropping system

Treatment	Number of branches (plant <sup>-1</sup> )									
	90 DAS									
	2017-18			2018-19			Mean			
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	
<b>Residual effect of <i>kharif</i></b>										
<b>RT1- SSNM</b>	32.67	23.29	27.98	32.91	23.36	28.13	32.79	23.33	28.06	
<b>RT2- N Omission</b>	28.00	21.68	24.84	28.12	21.74	24.93	28.06	21.71	24.88	
<b>RT3- P Omission</b>	26.62	21.42	24.02	26.70	21.40	24.05	26.66	21.41	24.03	
<b>RT4- K Omission</b>	27.27	21.33	24.30	27.34	21.48	24.41	27.30	21.41	24.35	
<b>RT5- RDF</b>	30.06	22.79	26.42	30.14	22.86	26.50	30.10	22.82	26.46	
<b>RT6- Farmer's practices</b>	29.81	22.08	25.94	29.90	22.14	26.02	29.85	22.11	25.98	
<b>RT7- Absolute control</b>	24.52	18.72	21.62	24.59	18.60	21.60	24.55	18.66	21.61	
<b>RT8- STCR</b>	31.13	23.49	27.31	31.25	23.57	27.41	31.19	23.53	27.36	
<b>Mean</b>	28.76	21.85		28.87	21.89		28.81	21.87		
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		
<b>Residual effect</b>	<b>0.63</b>	<b>1.81</b>		<b>0.63</b>	<b>1.81</b>		<b>0.63</b>	<b>1.81</b>		
<b>Direct effect</b>	<b>0.31</b>	<b>0.90</b>		<b>0.31</b>	<b>0.91</b>		<b>0.31</b>	<b>0.91</b>		
<b>Interaction</b>	<b>0.89</b>	<b>0.89</b>		<b>0.89</b>	<b>NS</b>		<b>0.89</b>	<b>NS</b>		

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>



**Table.13** Direct and residual effect of SSNM based fertilizer application on number of branches (plant<sup>-1</sup>) of chickpea at harvest under soybean-chickpea cropping system

Treatment	Number of branches (plant <sup>-1</sup> )								
	At harvest								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	27.18	17.60	22.39	27.51	17.79	22.65	27.35	17.70	22.52
<b>RT2- N Omission</b>	22.37	15.90	19.13	22.66	16.29	19.48	22.51	16.10	19.30
<b>RT3- P Omission</b>	19.78	15.64	17.71	19.96	15.43	17.70	19.87	15.53	17.70
<b>RT4- K Omission</b>	21.35	15.17	18.26	21.53	15.92	18.73	21.44	15.55	18.49
<b>RT5- RDF</b>	25.14	16.49	20.82	25.83	16.70	21.27	25.48	16.60	21.04
<b>RT6- Farmer's practices</b>	23.33	16.12	19.73	23.78	16.34	20.06	23.56	16.23	19.89
<b>RT7- Absolute control</b>	18.37	11.57	14.97	18.48	11.50	14.99	18.42	11.54	14.98
<b>RT8- STCR</b>	26.53	17.79	22.16	26.92	18.01	22.47	26.73	17.90	22.31
<b>Mean</b>	23.01	15.79		23.33	16.00		23.17	15.89	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.48</b>	<b>1.39</b>		<b>0.52</b>	<b>1.51</b>		<b>0.50</b>	<b>1.44</b>	
<b>Direct effect</b>	<b>0.24</b>	<b>0.69</b>		<b>0.26</b>	<b>0.75</b>		<b>0.25</b>	<b>0.72</b>	
<b>Interaction</b>	<b>0.68</b>	<b>1.96</b>		<b>0.74</b>	<b>2.14</b>		<b>0.71</b>	<b>2.04</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.14** Direct and residual effect of SSNM based fertilizer application on leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of chickpea under soybean-chickpea cropping system

Treatment	Leaf area (cm <sup>2</sup> plant <sup>-1</sup> )								
	30 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
Residual effect of <i>kharif</i>									
<b>RT1- SSNM</b>	161.02	100.13	130.57	165.13	104.01	134.57	163.07	102.07	132.57
<b>RT2- N Omission</b>	134.58	90.93	112.76	137.73	93.27	115.50	136.15	92.10	114.13
<b>RT3- P Omission</b>	122.37	88.46	105.42	123.87	89.97	106.92	123.12	89.21	106.17
<b>RT4- K Omission</b>	128.69	81.47	105.08	131.16	84.11	107.64	129.92	82.79	106.36
<b>RT5- RDF</b>	147.68	96.60	122.14	150.22	99.55	124.89	148.95	98.07	123.51
<b>RT6- Farmer's practices</b>	142.68	94.51	118.60	144.67	94.81	119.74	143.68	94.66	119.17
<b>RT7- Absolute control</b>	113.50	80.20	96.85	114.25	79.41	96.83	113.88	79.81	96.84
<b>RT8- STCR</b>	155.36	102.56	128.96	159.63	106.86	133.25	157.50	104.71	131.10
<b>Mean</b>	138.23	91.86		140.83	94.00		139.53	92.93	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>3.02</b>	<b>8.71</b>		<b>2.75</b>	<b>7.94</b>		<b>2.83</b>	<b>8.16</b>	
<b>Direct effect</b>	<b>1.51</b>	<b>4.36</b>		<b>1.37</b>	<b>3.97</b>		<b>1.41</b>	<b>4.08</b>	
<b>Interaction</b>	<b>4.26</b>	<b>12.32</b>		<b>3.89</b>	<b>11.22</b>		<b>4.00</b>	<b>11.54</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.15** Direct and residual effect of SSNM based fertilizer application on leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of chickpea at 60 DAS under soybean-chickpea cropping system

Treatment	Leaf area (cm <sup>2</sup> plant <sup>-1</sup> )								
	60 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
Residual effect of <i>kharif</i>									
<b>RT1- SSNM</b>	332.41	260.18	296.30	340.15	264.49	302.32	336.28	262.34	299.31
<b>RT2- N Omission</b>	303.62	233.20	268.41	308.48	236.66	272.57	306.05	234.93	270.49
<b>RT3- P Omission</b>	286.30	227.66	256.98	290.20	227.99	259.10	288.25	227.83	258.04
<b>RT4- K Omission</b>	291.53	218.97	255.25	298.88	230.40	264.64	295.21	224.69	259.95
<b>RT5- RDF</b>	316.50	251.63	284.07	324.60	255.51	290.06	320.55	253.57	287.06
<b>RT6- Farmer's practices</b>	310.81	244.50	277.66	317.30	248.92	283.11	314.06	246.71	280.38
<b>RT7- Absolute control</b>	279.82	203.33	241.58	285.55	196.60	241.08	282.69	199.97	241.33
<b>RT8- STCR</b>	324.60	266.60	295.60	331.08	271.33	301.21	327.84	268.97	298.40
<b>Mean</b>	305.70	238.26		312.03	241.49		308.86	239.87	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>6.78</b>	<b>19.58</b>		<b>6.91</b>	<b>19.95</b>		<b>6.84</b>	<b>19.77</b>	
<b>Direct effect</b>	<b>3.39</b>	<b>9.79</b>		<b>3.45</b>	<b>9.98</b>		<b>3.42</b>	<b>9.88</b>	
<b>Interaction</b>	<b>9.59</b>	<b>NS</b>		<b>9.77</b>	<b>NS</b>		<b>9.68</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.16** Direct and residual effect of SSNM based fertilizer application on leaf area (cm<sup>2</sup> plant<sup>-1</sup>) of chickpea at 90 DAS under soybean-chickpea cropping system

Treatment	Leaf area (cm <sup>2</sup> plant <sup>-1</sup> )								
	90 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
Residual effect of <i>kharif</i>									
RT1- SSNM	343.09	270.23	306.66	351.22	275.50	313.36	347.15	272.87	310.01
RT2- N Omission	313.11	242.59	277.85	318.07	247.83	282.95	315.59	245.21	280.40
RT3- P Omission	297.86	236.97	267.42	301.10	236.89	269.00	299.48	236.93	268.21
RT4- K Omission	302.15	227.26	264.71	307.14	241.03	274.09	304.65	234.15	269.40
RT5- RDF	328.17	262.33	295.25	336.33	264.27	300.30	332.25	263.30	297.78
RT6- Farmer's practices	320.13	255.40	287.77	319.05	257.49	288.27	319.59	256.45	288.02
RT7- Absolute control	288.10	211.25	249.68	296.33	205.40	250.87	292.22	208.33	250.27
RT8- STCR	335.93	273.87	304.90	342.26	280.13	311.20	339.10	277.00	308.05
Mean	316.07	247.49		321.44	251.07		318.75	249.28	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
Residual effect	<b>7.09</b>	<b>20.47</b>		<b>7.15</b>	<b>20.66</b>		<b>7.11</b>	<b>20.55</b>	
Direct effect	<b>3.54</b>	<b>10.24</b>		<b>3.58</b>	<b>10.33</b>		<b>3.56</b>	<b>10.27</b>	
Interaction	<b>10.02</b>	<b>NS</b>		<b>10.12</b>	<b>NS</b>		<b>10.06</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.17** Direct and residual effect of SSNM based fertilizer application on leaf area index (plant<sup>-1</sup>) of chickpea at 30 DAS under soybean-chickpea cropping system

Treatment	Leaf area index (plant <sup>-1</sup> )								
	30 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	0.54	0.33	0.44	0.55	0.35	0.45	0.54	0.34	0.44
<b>RT2- N Omission</b>	0.45	0.30	0.38	0.46	0.31	0.39	0.45	0.31	0.38
<b>RT3- P Omission</b>	0.41	0.29	0.35	0.41	0.30	0.36	0.41	0.30	0.35
<b>RT4- K Omission</b>	0.43	0.27	0.35	0.44	0.28	0.36	0.43	0.28	0.35
<b>RT5- RDF</b>	0.49	0.32	0.41	0.50	0.33	0.42	0.50	0.33	0.41
<b>RT6- Farmer's practices</b>	0.48	0.32	0.40	0.48	0.32	0.40	0.48	0.32	0.40
<b>RT7- Absolute control</b>	0.38	0.27	0.32	0.38	0.26	0.32	0.38	0.27	0.32
<b>RT8- STCR</b>	0.52	0.34	0.43	0.53	0.36	0.44	0.52	0.35	0.44
<b>Mean</b>	0.46	0.31		0.47	0.31		0.47	0.31	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.010</b>	<b>0.029</b>		<b>0.009</b>	<b>0.026</b>		<b>0.009</b>	<b>0.027</b>	
<b>Direct effect</b>	<b>0.005</b>	<b>0.015</b>		<b>0.005</b>	<b>0.013</b>		<b>0.005</b>	<b>0.014</b>	
<b>Interaction</b>	<b>0.014</b>	<b>0.041</b>		<b>0.013</b>	<b>0.037</b>		<b>0.013</b>	<b>0.038</b>	

SSNM39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.18** Direct and residual effect of SSNM based fertilizer application on leaf area index (plant<sup>-1</sup>) of chickpea at 60 DAS under soybean-chickpea cropping system

Treatment	Leaf area index (plant <sup>-1</sup> )								
	60 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	1.11	0.87	0.99	1.13	0.88	1.01	1.12	0.87	1.00
<b>RT2- N Omission</b>	1.01	0.78	0.89	1.03	0.79	0.91	1.02	0.78	0.90
<b>RT3- P Omission</b>	0.95	0.76	0.86	0.97	0.76	0.86	0.96	0.76	0.86
<b>RT4- K Omission</b>	0.97	0.73	0.85	1.00	0.77	0.88	0.98	0.75	0.87
<b>RT5- RDF</b>	1.06	0.84	0.95	1.08	0.85	0.97	1.07	0.85	0.96
<b>RT6- Farmer's practices</b>	1.04	0.82	0.93	1.06	0.83	0.94	1.05	0.82	0.93
<b>RT7- Absolute control</b>	0.93	0.68	0.81	0.95	0.66	0.80	0.94	0.67	0.80
<b>RT8- STCR</b>	1.08	0.89	0.99	1.10	0.90	1.00	1.09	0.90	0.99
<b>Mean</b>	1.02	0.79		1.04	0.80		1.03	0.80	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.023</b>	<b>0.065</b>		<b>0.023</b>	<b>0.067</b>		<b>0.023</b>	<b>0.066</b>	
<b>Direct effect</b>	<b>0.011</b>	<b>0.033</b>		<b>0.012</b>	<b>0.033</b>		<b>0.011</b>	<b>0.033</b>	
<b>Interaction</b>	<b>0.032</b>	<b>NS</b>		<b>0.033</b>	<b>NS</b>		<b>0.032</b>	<b>NS</b>	

SSNM39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.19** Direct and residual effect of SSNM based fertilizer application on leaf area index (plant<sup>-1</sup>) of chickpea at 90 DAS under soybean-chickpea cropping system

Treatment	Leaf area index (plant <sup>-1</sup> )								
	90 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
Residual effect of <i>kharif</i>									
RT1- SSNM	1.14	0.90	1.02	1.17	0.92	1.04	1.16	0.91	1.03
RT2- N Omission	1.04	0.81	0.93	1.06	0.83	0.94	1.05	0.82	0.93
RT3- P Omission	0.99	0.79	0.89	1.00	0.79	0.90	1.00	0.79	0.89
RT4- K Omission	1.01	0.76	0.88	1.02	0.80	0.91	1.02	0.78	0.90
RT5- RDF	1.09	0.87	0.98	1.12	0.88	1.00	1.11	0.88	0.99
RT6- Farmer's practices	1.07	0.85	0.96	1.06	0.86	0.96	1.07	0.85	0.96
RT7- Absolute control	0.96	0.70	0.83	0.99	0.68	0.84	0.97	0.69	0.83
RT8- STCR	1.12	0.91	1.02	1.14	0.93	1.04	1.13	0.92	1.03
Mean	1.05	0.82		1.07	0.84		1.06	0.83	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
Residual effect	<b>0.024</b>	<b>0.068</b>		<b>0.024</b>	<b>0.069</b>		<b>0.024</b>	<b>0.068</b>	
Direct effect	<b>0.012</b>	<b>0.034</b>		<b>0.012</b>	<b>0.034</b>		<b>0.012</b>	<b>0.034</b>	
Interaction	<b>0.033</b>	<b>NS</b>		<b>0.034</b>	<b>NS</b>		<b>0.034</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>



**Table.20** Direct and residual effect of SSNM based fertilizer application on dry matter accumulation (g plant<sup>-1</sup>) of chickpea at 30 DAS under soybean-chickpea cropping system

Treatment	Dry matter accumulation (g plant <sup>-1</sup> )								
	30 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	2.22	1.07	1.64	2.33	1.12	1.72	2.27	1.09	1.68
<b>RT2- N Omission</b>	1.68	0.81	1.24	1.74	0.85	1.29	1.71	0.83	1.27
<b>RT3- P Omission</b>	1.54	0.77	1.16	1.63	0.80	1.22	1.59	0.79	1.19
<b>RT4- K Omission</b>	1.62	0.70	1.16	1.67	0.73	1.20	1.64	0.71	1.18
<b>RT5- RDF</b>	1.90	0.94	1.42	1.97	0.99	1.48	1.94	0.96	1.45
<b>RT6- Farmer's practices</b>	1.77	0.88	1.32	1.83	0.91	1.37	1.80	0.89	1.35
<b>RT7- Absolute control</b>	1.40	0.49	0.95	1.45	0.47	0.96	1.43	0.48	0.95
<b>RT8- STCR</b>	2.01	1.15	1.58	2.11	1.22	1.67	2.06	1.19	1.62
<b>Mean</b>	1.77	0.85		1.84	0.88		1.80	0.87	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.12</b>	<b>0.35</b>		<b>0.13</b>	<b>0.39</b>		<b>0.13</b>	<b>0.36</b>	
<b>Direct effect</b>	<b>0.06</b>	<b>0.17</b>		<b>0.07</b>	<b>0.19</b>		<b>0.06</b>	<b>0.18</b>	
<b>Interaction</b>	<b>0.17</b>	<b>NS</b>		<b>0.19</b>	<b>NS</b>		<b>0.18</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.21** Direct and residual effect of SSNM based fertilizer application on dry matter accumulation (g plant<sup>-1</sup>) of chickpea at 60 DAS under soybean-chickpea cropping system

Treatment	Dry matter accumulation (g plant <sup>-1</sup> )								
	60 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	17.54	11.64	14.59	17.88	11.81	14.84	17.71	11.72	14.72
<b>RT2- N Omission</b>	15.30	10.20	12.75	15.60	10.32	12.96	15.45	10.26	12.85
<b>RT3- P Omission</b>	14.36	9.68	12.02	14.65	9.77	12.21	14.50	9.73	12.11
<b>RT4- K Omission</b>	14.83	9.41	12.12	15.13	9.48	12.31	14.98	9.44	12.21
<b>RT5- RDF</b>	16.03	10.94	13.49	16.37	11.07	13.72	16.20	11.01	13.60
<b>RT6- Farmer's practices</b>	15.94	10.51	13.23	16.26	10.65	13.45	16.10	10.58	13.34
<b>RT7- Absolute control</b>	13.01	7.84	10.43	13.27	7.81	10.54	13.14	7.83	10.48
<b>RT8- STCR</b>	16.56	12.06	14.31	16.91	12.31	14.61	16.73	12.18	14.46
<b>Mean</b>	15.45	10.28		15.76	10.40		15.60	10.34	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.53</b>	<b>1.54</b>		<b>0.62</b>	<b>1.79</b>		<b>0.55</b>	<b>1.58</b>	
<b>Direct effect</b>	<b>0.27</b>	<b>0.77</b>		<b>0.31</b>	<b>0.90</b>		<b>0.27</b>	<b>0.79</b>	
<b>Interaction</b>	<b>0.75</b>	<b>NS</b>		<b>0.88</b>	<b>NS</b>		<b>0.77</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.22** Direct and residual effect of SSNM based fertilizer application on dry matter accumulation (g plant<sup>-1</sup>) of chickpea at 90 DAS under soybean-chickpea cropping system

Treatment	Dry matter accumulation (g plant <sup>-1</sup> )								
	90 DAS								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	25.91	16.56	21.24	26.80	17.48	22.14	26.36	17.02	21.69
<b>RT2- N Omission</b>	23.32	14.85	19.09	24.45	15.89	20.17	23.89	15.37	19.63
<b>RT3- P Omission</b>	20.76	14.36	17.56	21.50	15.40	18.45	21.13	14.88	18.00
<b>RT4- K Omission</b>	21.53	13.87	17.70	22.76	15.27	19.02	22.15	14.57	18.36
<b>RT5- RDF</b>	24.87	16.03	20.45	25.63	16.66	21.15	25.25	16.35	20.80
<b>RT6- Farmer's practices</b>	24.20	15.64	19.92	25.29	16.30	20.80	24.75	15.97	20.36
<b>RT7- Absolute control</b>	19.88	10.13	15.01	20.33	10.06	15.20	20.11	10.10	15.10
<b>RT8- STCR</b>	25.43	16.66	21.05	26.32	18.11	22.22	25.88	17.39	21.63
<b>Mean</b>	23.24	14.76		24.14	15.65		23.69	15.20	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>0.75</b>	<b>2.15</b>		<b>0.72</b>	<b>2.07</b>		<b>0.60</b>	<b>1.75</b>	
<b>Direct effect</b>	<b>0.37</b>	<b>1.08</b>		<b>0.36</b>	<b>1.04</b>		<b>0.30</b>	<b>0.87</b>	
<b>Interaction</b>	<b>1.05</b>	<b>NS</b>		<b>1.02</b>	<b>NS</b>		<b>0.85</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

**Table.23** Direct and residual effect of SSNM based fertilizer application on dry matter accumulation (g plant<sup>-1</sup>) of chickpea at harvest under soybean-chickpea cropping system

Treatment	Dry matter accumulation (g plant <sup>-1</sup> )								
	At harvest								
	2017-18			2018-19			Mean		
	Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>			Direct effect of <i>rabi</i>		
	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean	Treated (F1)	Control (F2)	Mean
<b>Residual effect of <i>kharif</i></b>									
<b>RT1- SSNM</b>	30.80	19.71	25.26	31.36	20.49	25.93	31.08	20.10	25.59
<b>RT2- N Omission</b>	26.36	17.35	21.86	27.54	17.97	22.76	26.95	17.66	22.31
<b>RT3- P Omission</b>	25.19	16.78	20.98	25.89	17.26	21.58	25.54	17.02	21.28
<b>RT4- K Omission</b>	26.18	16.50	21.34	26.82	17.19	22.01	26.50	16.85	21.67
<b>RT5- RDF</b>	28.24	19.17	23.70	28.81	20.12	24.47	28.52	19.64	24.08
<b>RT6- Farmer's practices</b>	27.33	18.55	22.94	28.21	19.47	23.84	27.77	19.01	23.39
<b>RT7- Absolute control</b>	23.33	13.69	18.51	24.08	13.53	18.81	23.71	13.61	18.66
<b>RT8- STCR</b>	28.90	20.00	24.45	29.42	21.03	25.23	29.16	20.52	24.84
<b>Mean</b>	30.80	19.71	25.26	27.77	18.38		27.40	18.05	
	<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>		<b>SEm±</b>	<b>CD</b>	
<b>Residual effect</b>	<b>1.18</b>	<b>3.42</b>		<b>1.09</b>	<b>3.16</b>		<b>0.85</b>	<b>2.44</b>	
<b>Direct effect</b>	<b>0.59</b>	<b>1.71</b>		<b>0.55</b>	<b>1.58</b>		<b>0.42</b>	<b>1.22</b>	
<b>Interaction</b>	<b>1.67</b>	<b>NS</b>		<b>1.55</b>	<b>NS</b>		<b>1.20</b>	<b>NS</b>	

SSNM- 39:60:40 kg NPK ha<sup>-1</sup>; RDF- 25:60:40:20 kg NPKS ha<sup>-1</sup>; Farmer's practices- 50 kg acre<sup>-1</sup> DAP; STCR-25:97:85 kg NPK ha<sup>-1</sup>

In chickpea crop the treatment RT1 (SSNM) gave significantly highest value of leaf area index at 30, 60 and 90 DAS during both the years of investigation and their mean value. But, it was at par with the treatments RT8 (STCR) and RT5 (RDF) at 30 DAS and with RT8 (STCR), RT5 (RDF) and RT6 (Farmer's practices) at 60 DAS and at harvest during both the years of investigation and their mean. The treatment RT7 (Absolute control) gave significantly minimum value of leaf area index of chickpea, regarding to direct application of nutrient to chickpea crop and untreated control plot, during both the years and in their average at all the stages. The maximum leaf area index (LAI) was might be due to the rises in number of leaves plant<sup>-1</sup> and total leaf area plant<sup>-1</sup>. Nitrogen is a main element of enzymes, proteins and chlorophyll and has been found to influence the growth of leaf and its development, resulting in increased leaf area index (LAI). The results are accordance to the findings of Zarei *et al.*, (2011).

### **Effect on dry matter accumulation (g plant<sup>-1</sup>)**

In soybean at 30 DAS, maximum dry matter accumulation (0.86 and 0.93 g) was found under the treatment T1 (SSNM) during both the years of investigation and in their mean. The lowest dry matter accumulation (0.70 and 0.72 g) was recorded under the treatment T7 (Absolute control) but it was found non-significant in during both the years of experiment and in their mean. Significantly maximum dry matter accumulation at 60, 90 DAS and at harvest (25.29, 51.00 and 58.33 during 2017 and 28.41, 52.33 and 58.00 during 2018, respectively) was observed under T1 (SSNM). But the data of highest dry matter accumulation was found at par with T8 (STCR) at all the stages during both the years of investigation and their average. Significantly the minimum dry matter accumulation of soybean was noticed under

the treatment T7 (Absolute control) at 60, 90 DAS and at harvest during both the years of testing and their average data.

The data of chickpea crop revealed that treatment RT1 (SSNM) gave significantly maximum dry matter accumulation plant<sup>-1</sup> of chickpea during both the years of field experiment and in their mean at all the stages of crop observations (30, 60, 90 DAS and at harvest). But, it was at par with RT8 (STCR), RT5 (RDF) and RT6 (Farmer's practices) at 30 DAS, 60 DAS and at harvest during both the years of field investigation and their mean. At 90 DAS, the maximum value was also at par with RT8 (STCR), RT5 (RDF), RT6 (Farmer's practices) and RT2 (N Omission) during both the years of field experiment. Dry matter accumulation plant<sup>-1</sup> of chickpea was significantly least under the treatment RT7 (Absolute control), regarding direct application of nutrient to chickpea crop and control plot during both the years and in their mean at all the stages. The data shows that dry matter accumulation plant<sup>-1</sup> of chickpea were higher under direct application of nutrient as compared to untreated control plot. Interaction effect of residual and direct application was found non-significant during both the years of field experiment and their average data, at all the stages of crop observation. Site specific nutrient management (SSNM) practices supplied the balanced amount of nutrients as well as maintaining the soil physical properties, which have increased the availability of essential elements particularly of nitrogen, phosphorus and potassium.

Higher number of leaves and maximum LAI are the main reason for production of higher photosynthetic dry matter. The production of maximum number of branches plant<sup>-1</sup>, higher number of leaves plant<sup>-1</sup> and maximum plant height under SSNM treatment plots are also a main reason for producing highest dry matter plant<sup>-1</sup>.

## References

- Chauhan, G.S., Verma, N. S. and Bains, G. S. 1988. Effect of extrusion processing on the nutritional quality of protein in rice legume blends. *Nahrung*, 32: 43.
- Tiwari, K.N. and Gill, M.S. 2007. Doubling productivity and profit of rice production system through site-specific nutrient management-PDCSR - IPNI collaborative research project with rice-wheat system. *Indian Farming*. 57 (6): 3-7, 40.
- Pasuquin, J.M., Pampolino, M.F., Witt, C., Dobermann, A., Oberthur, T., Fisher, M.J., and Inubushi, K. 2014. Closing yield gaps in maize production in Southeast Asia through site-specific nutrient management. *Field Crops Research*, 156: 219-230.
- Maheshbabu, H.M. Hunje, R., Patil, N.K..B. and Babalad, H.B. 2008. Effect of organic manures on plant growth, seed yield and quality of soybean. *Karnataka J. Agric. Sci.*, 21(2): 219-221.
- Yagoub, S.O., Salam, A.K., Hassan, M.M. and Hassan, M.A. 2015. Effects of organic and mineral fertilizers on growth and yield of soybean (*Glycine max* L. Merrill). *International Journal of Agronomy and Agricultural Research*, 7(1): 45-52.
- Zarei, I., Khah, E.M., Mohammadi, G. and Petropoulos, S. 2011. Assessment of growth and yield components following the application of different biological fertilizers on soybean (*Glycine max* L.) cultivation. *Australian Journal of Crop Science*, 5(13): 1776-1782.
- Qureshi, A., Singh, D.K., Pandey, P.C., Singh, V.P. and Raverkar, K.P. 2016. Site specific nutrient management approaches for enhancing productivity and profitability in rice and wheat under rice-wheat cropping system. *International Journal of Agriculture Sciences*, 8(54): 2838-2842.

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