Original Research Article

Effect of seed rate and spacing on nutrient uptake in chickpea

ABSTRACT

The research was carried out at Research Farm, Department of Agriculture, Maharishi Markandeshwar University, Sadopur, Ambala during *Rabi* season in 2020-2021. The experiment was laid out in Split Plot Design (SPD), with three replication and 9 treatments with two conditions *i.e.* three different seed rate (60, 75 and 90 kg/ha) were design in main plot, where as in sub-plot three spacing (20, 30 and 40 cm) were tested. The interaction between seed rate and spacing between the rows significantly influenced the N, P and K status in soil. Maximum available N, P, K was recorded at the seed rate of 75kg/ha. Irrespective of the seed rate maximum N, P, K content was found at the spacing of 30 cm in all treatments. Similar observation was also recorded in case of N, P, K nutrient content (%) in seed and straw. The maximum N, P, K uptake and protein content was also observed at 75kg/ha seed rate with 30cm row spacing.

KEYWORDS: Chickpea, Protein Content, Available NPK and Nutrient Uptake

Introduction

Chickpea (*Cicerarietinum* L.) is one of the most important legume crop which belongs to the family Fabaceae. Globally, chickpea is grown over an area of 131.1 million hectare with the total production 127.3 million tonnes and productivity of 970 kg/ha (Anonymous, 2019a). Around the world, it is found to be the second most cultivated legume crop by small holder farmers of the semi-arid regions (Thudi*et al.,* 2014). It is a high value crop suitable for deep black soils in the cool semi arid areas of the tropics, sub-tropics as well as temperate areas (Agajie, 2018). India ranks first in area and production but not in terms of productivity (Samriti *et al.*, 2020). It is winter season pulse crop cultivated in different parts of the country, grown successfully in Madhya Pradesh, Rajasthan, Maharashtra, Karnataka, Andhra Pradesh and Uttar Pradesh (Kumar *et al*., 2015).

The seed rate impacts a lot in overall growth and production of Chickpea. Moreover, recommended seed rate differs for cultivar to cultivar along with seed size, location, soil moisture and environmental conditions such as rainfall and temperature (Chang *et al*., 2006). The emergence count per meter row length was influenced by the seed rate because of presence of abundant seeds, which absorbs moisture present in soil thus creating the competition for soil moisture (Singh *et al*., 2017). It was also found that increase in seed rate also increase the height of plant, as there was competition among the plants for sunlight (Cokkizgin, 2012).The use of low seed rate, poor quality seed, inadequate moisture level at time of sowing, plant mortality due to various disease or salinity or moisture stress could affect plant stand. To maintain sufficient plant population, the requirement of optimum seed rate of good quality is recommended (Singh *et al*., 2017). The effect of seed rate showed an increasing trend of N uptake with increase in plant population. When plants are sown at optimum level (60 $kgha^{-1}$ seed rate), they get adequate levels of nitrogen that results in increased level of protein. Moreover, increase in the seed rate causes decrease in the protein content of the seeds (Sethi *et al*., 2017).

Material and Methods

Experiment was conducted at Research Farm, Department of Agriculture, Maharishi Markandeshwar University, Sadopur Ambala (Haryana) during *Rabi* season 2020-2021. The experiment was laid out in split plot design where nine treatments and three replications were designed in of November 2020. The fertilizer application of Nitrogen, Phosphorus, Potassium at the rate of 20kg/ha, 40kg/ha and 17 kg/ha, respectively, were broadcasted at the time of sowing in the form of Urea, DAP and MOP. In the beginning, before conducting the experiment in the field, the soil samples were collected randomly from different plots upto depth of 0-15cm and composite soil samples were prepared. The samples of crop produce (Seed and Straw) were collected from each treatment at harvest, dried in an oven at 60^0C for 72 hours, than processed and analyzed for N, P, K and protein content in seed and straw. Table 2 indicated the details of method employed for estimating different treatments.The NPK uptake by seed and straw in each plot was obtained by multiplying the nutrient content (%) with crop yield. The total nutrient uptake of N, P, K at harvest was calculated as under:

$$\text{Nutrient uptake by seed (kg ha}^{-1}) = \frac{\text{Nutrient content (\%)} \times \text{Seed yield (kg ha}^{-1})}{100}$$

$$\text{Nutrient uptake by straw (kg ha}^{-1}) = \frac{\text{Nutrient content (\%)} \times \text{Straw yield (kg ha}^{-1})100}{100}$$

Protein content in chickpea seeds and straw

The protein content (%) of seed and straw was determined by multiplying the N content (%) of seed and straw with 6.25 to obtain crude protein content.

Results and Discussion

NPK status in soil (kg/ha)

The data regarding nitrogen, phosphorus and potassium status in soil have been embodied in Table 1. The maximum N (133.84 **kg/ha**), P (22.44 **kg/ha**) and K (101.56 **kg/ha**) in soil was observed in 75 **kg/ha** seed rate with row spacing of 30cm. The minimum N (125.36 **kg/ha**), P (16.43 **kg/ha**) and K (91.60 **kg/ha**) status in soil was recorded with the seed rate of 90 **kg/ha** and row spacing of 20cm.

Table 1 Effect of seed rate and spacing on available N, P and K (kg/ha) in soil

N(kg ha^{-1})				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	127.57	132.44	130.78	130.26
75 kg ha^{-1}	129.48	133.84	132.22	131.85
90 kg ha^{-1}	125.36	130.39	125.62	127.12
Mean	127.47	132.22	129.54	

C.D.(5%)(Seed rate)=1.35, C.D.(5%)(Spacing)= 0.64, C.D.(5%)(Seed rate × Spacing)= 1.10
SEm± (Seed rate)= 0.33, SEm± (Spacing)= 0.20, SEm± (Seed rate × Spacing)= 0.35

P(kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	17.78	21.18	18.87	19.28
75 kg ha^{-1}	18.95	22.44	20.17	20.17
90 kg ha^{-1}	16.43	20.07	18.07	18.19
Mean	17.72	21.23	19.04	

C.D.(5%)(Seed rate)=0.91, C.D.(5%)(Spacing)=0.48, C.D.(5%)(Seed rate × Spacing)= 0.82
SEm± (Seed rate)=0.22, SEm± (Spacing)=0.15, SEm± (Seed rate × Spacing)= 0.26

K(kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	92.53	101.16	96.60	96.76
75 kg ha^{-1}	97.33	101.56	100.63	99.84
90 kg ha^{-1}	91.60	99.43	48.46	96.50
Mean	93.82	100.72	98.56	

C.D.(5%)(Seed rate)=1.46, C.D.(5%) (Spacing)=0.66, C.D.(5%)(Seed rate × Spacing)= 1.13
SEm± (Seed rate)=0.36, SEm± (Spacing)=0.21, SEm± (Seed rate × Spacing)= 0.36

In case of seed rate, the overall highest N (131.85 kg ha^{-1}) and K (99.84 kg ha^{-1}) in soil was recorded under 75 kg ha^{-1} seed rate, and was followed by 60 kg ha^{-1} and 90 kg ha^{-1}seed rate, respectively. The maximum value of available P (20.17 kg ha^{-1}) was found when seed was sown at 75kg ha^{-1} seed rate and at par with 60 kg ha^{-1}seed rate.

In case of inter row spacing, the overall highest N (132.22 kg ha^{-1}), P (21.23 kg ha^{-1}) and K (100.72 kg ha^{-1})in soil was observed under 30cm row spacing, which was followed by 40cm and 20 cm row spacing, respectively.

N content in seed and straw (%)

Maximum N content in seed (3.68%) and straw (0.98%) was found superior with the use of 75 **kg/ha** seed rate and row spacing of 30cm. The reduction in N content in seed (3.21%) and straw (0.82%) was at 90 **kg/ha** seed rate and row spacing of 20 cm where as the interaction effect of 90 **kg/ha** seed rate and 40 cm row spacing showed minimum N content in straw (0.82%).

Table 2 Effect of seed rate and spacing on N content (%) in seed and straw

N content in seed (%)

Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	3.53	3.66	3.60	3.59
75 kg ha^{-1}	3.57	3.68	3.63	3.63
90 kg ha^{-1}	3.26	3.54	3.21	3.34
Mean	3.45	3.63	3.21	

C.D.(5%)(Seed rate)=0.21, C.D.(5%)(Spacing)= 0.08, C.D.(5%)(Seed rate × Spacing)= 0.14
SEm± (Seed rate)= 0.05, SEm± (Spacing)= 0.03, SEm± (Seed rate × Spacing)= 0.04

N content in straw (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	0.86	0.93	0.90	0.90
75 kg ha^{-1}	0.92	0.98	0.92	0.94
90 kg ha^{-1}	0.82	0.92	0.90	0.88
Mean	0.87	0.94	0.91	

C.D.(5%)(Seed rate)=0.03, C.D.(5%)(Spacing)= 0.03, C.D.(5%)(Seed rate × Spacing)= 0.03
SEm± (Seed rate)=0.008, SEm± (Spacing)=0.009, SEm±(Seed rate × Spacing)= 0.011

Regarding different seed rate, average highest N content in seed (3.63%) under 75 **kg/ha** seed rate, which was statistically at par with seed rate of 60 **kg/ha** .On the other side, highest N content in straw (0.94%) was observed in case of 75 **kg/ha** seed rate.

Regarding different row spacing, average highest N content in seed (3.63%) was obtained under 30cm row spacing as compared to other treatments while highest N content in straw (0.94%) was recorded under 30 cm row spacing and it was at par with 40 cm row spacing. It is due to improvement in nodulation in case of wider-row spacing. The similar research was observed by Chauhan (2000).

N uptake by seed and straw (kg/ha)

The result showed that maximum N uptake by seed (85.77 **kg/ha**) and by straw (25.57 **kg/ha**) was noticed from the plots with seed rate of 75 **kg/ha** and row spacing of 30 cm. Likewise, minimum N uptake by seed (66.54 **kg/ha**) and by straw (19.37 **kg/ha**) was recorded in plot having seed rate of 90 **kg/ha** and row spacing of 20cm.

On the basis of seed rate, the mean N uptake was highest in seed (79.90 **kg/ha**) and straw (23.41 **kg/ha**) when seed was sown at 75 **kg/ha** seed rate, which was followed by seed rate of 60 **kg/ha** and 90 **kg/ha**, respectively. Lone *et al*. (2009) reported that in soyabean crop, the impact of seed

rate on nitrogen uptake was found to be more, when the plant population was increased. Therefore, the uptake of nutrients (Nitrogen) increased by increased in seed rate.

On the basis of row spacing, the overall highest N uptake by seed (78.74 **kg/ha**) was recorded when the crop was sown at 30cm row spacing and it was at par with 40 cm spacing while maximum N uptake by straw (24.06 **kg/ha**) was observed at row spacing of 30 cm. The similar result was quoted by Chauhan (2000) and Patel (1992). Therefore, they concluded that N uptake depends on the nitrogen content and yield of the crop. The maximum yield was obtained from the same treatment that is 30 cm row spacing.

Table 3 Effect of seed rate and spacing on N uptake (kg/ha) by seed and straw

N uptake by seed (kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	66.54	76.31	74.53	72.46
75 kg ha^{-1}	72.25	85.77	81.69	79.90
90 kg ha^{-1}	67.72	74.14	68.20	70.02
Mean	68.83	78.74	74.81	

C.D.(5%)(Seed rate)=4.14, C.D.(5%)(Spacing)= 4.37, C.D.(5%)(Seed rate × Spacing)= 7.47
SEm±(Seed rate)= 1.02, SE m± (Spacing)= 1.40, SEm± (Seed rate × Spacing)= 2.43

N uptake by straw (kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	19.37	22.30	21.80	21.16
75 kg ha^{-1}	21.37	25.57	23.30	23.41
90 kg ha^{-1}	19.84	22.60	20.04	20.83
Mean	20.01	24.06	22.04	

C.D.(5%)(Seed rate)=1.07, C.D.(5%)(Spacing)=1.36, C.D.(5%)(Seed rate × Spacing)= 2.33
SEm± (Seed rate)=0.26,SEm± (Spacing)=0.43, SEm± (Seed rate × Spacing)= 0.75

Phosphorus content in seed and straw (%)

Maximum Phosphorus content in seed (0.576%) and straw (0.537%) was recorded with the treatment combination of 75 **kg/ha** seed rate and row spacing of 30cm. The seed sown at 90 **kg/ha** seed rate and row spacing of 20 cm reported minimum Phosphorus content in seed (0.213%) and straw (0.312%).

Table 4 Effect of seed rate and spacing on P content (%) in seed and straw

P content in seed (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	0.220	0.450	0.382	0.351
75 kg ha^{-1}	0.379	0.576	0.416	0.457
90 kg ha^{-1}	0.213	0.477	0.310	0.334
Mean	0.271	0.501	0.369	

C.D.(5%)(Seed rate)=0.038, C.D.(5%)(Spacing)=0.032, C.D.(5%)(Seed rate × Spacing)=0.052

SEm± (Seed rate)=0.008, SEm± (Spacing)=0.009, SEm± (Seed rate × Spacing)=0.017

P content in straw (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	0.465	0.530	0.312	0.502
75 kg ha^{-1}	0.520	0.537	0.512	0.526
90 kg ha^{-1}	0.428	0.524	0.521	0.485
Mean	0.471	0.530	0.502	

C.D.(5%)(Seed rate)=0.031, C.D.(5%)(Spacing)=0.028, C.D.(5%)(Seed rate × Spacing)= 0.052

SEm± (Seed rate)=0.008,SEm±(Spacing)=0.009, SE m± (Seed rate × Spacing)= 0.017

Among different seed rates, phosphorus content was highest in seed (0.457%) under 75 **kg/ha** seed rate, which was followed by seed rate of 60 **kg/ha** and 90 **kg/ha**, respectively. The maximum phosphorus content in straw (0.526%) was noticed under 75 **kg/ha** seed rate. However, it was at par with 60 **kg/ha** seed rate.

Among different row spacing, phosphorus content was highest in seed (0.501%) under 30cm row spacing which was significantly higher as compared to other treatments. In case of straw, the maximum phosphorus content (0.530%) was recorded from the plots of 30 cm row spacing and it was at par with 40 cm row spacing. The accumulation of nitrogen and phosphorus in grain and straw was observed higher in row spacing of 30 cm than 20 cm row spacing (Kumar *et al*., 2003).

P uptake by seed and straw (kg/ha)

The data presented in Table 5 indicates that highest P uptake by seed (13.41 **kg/ha**) and straw (13.95 **kg/ha**) was obtained by the interaction of 75 **kg/ha** seed rate and row spacing of 30cm. On the other side, the seed rate of 60 **kg/ha** with 20 cm row spacing showed minimum effect of P uptake by seed (4.12 **kg/ha**) and lowest value of straw (9.95 **kg/ha**) was found in case of 90 **kg/ha** seed rate at 20 cm row spacing.

Table 5 Effect of seed rate and spacing on P uptake (kg/ha) by seed and straw

P uptake by seed (kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	4.12	9.41	7.90	7.14
75 kg ha^{-1}	7.64	13.41	9.36	10.13
90 kg ha^{-1}	4.13	9.95	6.06	6.71
Mean	5.30	10.92	7.74	

C.D.(5%)(Seed rate)=0.68, C.D.(5%)(Spacing)=0.84, C.D.(5%)(Seed rate × Spacing)= 1.45
SEm± (Seed rate)=0.16, SEm± (Spacing)= 0.27, SEm± (Seed rate × Spacing)= 0.46

P uptake by straw (kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	10.41	12.70	12.17	11.76
75 kg ha^{-1}	12.03	13.95	13.17	13.05
90 kg ha^{-1}	9.95	12.81	11.69	11.48
Mean	10.79	13.15	12.37	

C.D.(5%)(Seed rate)= 0.73, C.D.(5%)(Spacing)= 1.12, C.D.(5%)(Seed rate × Spacing)= 1.91
SEm± (Seed rate)= 0.18, SEm± (Spacing)= 0.36, SEm± (Seed rate × Spacing)= 0.62

On the basis of seed rate, the overall P uptake was highest in seed (10.13 **kg/ha**) and straw (13.05 **kg/ha**) from the treatment in which 75 **kg/ha** seed rate was used, which was followed by seed rate of 60 **kg/ha** and 90 **kg/ha** seed rate, respectively.The similar result was observed by Sethi*et al*. (2017) and Lone *et al*. (2009) in which they proved that impact of seed rate on nitrogen uptake is found to be more when plant population is increased. Therefore, uptake of phosphorus is more whenhigh seed rates was used (Jatindar and Badiyala, 2004).

On the basis of row spacing, the overall P uptake was highest in seed (10.92 **kg/ha**) and straw (13.15 **kg/ha**) was observed in the treatment in which 30cm row spacing was kept, where as maximum value of straw was at par with 40 cm row spacing. Chauhan (2000) and Patel (1992)

suggested that N uptake depends on the nitrogen content and yield of the crop, thus the maximum yield was obtained from the same treatment that is 30 cm row spacing.

K content in seed and straw(%)

The presented data of Table 6 showed that interaction effect of 75 **kg/ha** seed rate and inter row spacing of 20 cm resulted in highest K content in seed (0.639%) and straw (1.717%). Likewise, the minimum K content in seed (0.293%) and straw (1.213%) was observed when plot was sown at 90 **kg/ha** seed rate and spacing of 20cm between the rows.

In case of seed rate,the overall K content was highest in seed (0.552%) with the application of 75 **kg/ha** seed rate, which was followed by seed rate of 60 **kg/ha** and 90 **kg/ha** respectively. While highest K content in straw (1.594%) was observed in case of 75 **kg/ha** seed rate and was at par with 60 **kg/ha** seed rate. The accumulation of nitrogen and phosphorus in grain and straw was observed higher in row spacing of 30 cm than 20 cm row spacing (Kumar *et al*., 2003).

In case of row spacing, the overall maximum K content in seed (0.550%) and straw (1.646%) was observed at a spacing of 30cm between the rows, which was followed by row spacing of 40 and 20 cm, respectively.

Table 6 Effect of seed rate and spacing on K content (%) in seed and straw

K content in seed (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	0.347	0.484	0.421	0.417
75 kg ha^{-1}	0.451	0.639	0.566	0.552
90 kg ha^{-1}	0.293	0.528	0.383	0.401
Mean	0.364	0.550	0.457	

C.D.(5%)(Seed rate)=0.033, C.D.(5%)(Spacing)=0.044, C.D.(5%)(Seed rate × Spacing)= 0.078

SEm± (Seed rate)=0.008,SEm± (Spacing)= 0.014, SEm± (Seed rate × Spacing)=0.024

K content in straw (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	1.467	1.623	1.583	1.558
75 kg ha^{-1}	1.537	1.717	1.530	1.594
90 kg ha^{-1}	1.213	1.597	1.377	1.396
Mean	1.406	1.646	1.497	

C.D.(5%)(Seed rate)=0.071, C.D.(5%)(Spacing)=0.090, C.D.(5%)(Seed rate × Spacing)= 0.156
SEm± (Seed rate)=0.018,SEm± (Spacing)=0.029,SEm± (Seed rate × Spacing)=0.040

K uptake by seed and straw (kg/ha)

The data represented in Table 7 summarized the effect of seed rate and spacing on K uptake by seed and straw. The data indicated that significantly maximum K uptake by seed (14.85 **kg/ha**) and straw (44.62 **kg/ha**) was taken when 75 **kg/ha** seed rate was used with row spacing of 30cm. On the other side, plots of 90 **kg/ha** seed rate with row spacing of 20 cm showed minimum K uptake by seed and straw with respective values of 5.97 **kg/ha** and 28.19 **kg/ha**.

With respect to seed rate, the average increase in K uptake by seed (12.34 **kg/ha**) and straw (39.64 **kg/ha**) was examined with the use of 75 **kg/ha**, which was followed by 60 and 90 **kg/ha** seed rate, respectively. Jatinder and Kumar. (2004) on his study reported that when sowing rate increases, the uptake of nutrients (Potassium) also increased. The similar result was also quoted by Lone *et al*. (2009).

With respect to row spacing, the average increase in K uptake by seed (11.91 **kg/ha**) and straw (40.87 **kg/ha**) was recorded with the use of 30cm, which was followed by 40 and 20 cm row spacing, respectively.

Table 7 Effect of seed rate and spacing on K uptake (kg/ha) by seed and straw

K uptake by seed (kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	6.51	10.06	8.72	8.43
75 kg ha^{-1}	9.11	14.85	13.08	12.34
90 kg ha^{-1}	5.97	10.82	7.47	8.08
Mean	7.19	11.91	9.75	

C.D.(5%)(Seed rate)=0.99, C.D.(5%)(Spacing)=0.95, C.D.(5%)(Seed rate × Spacing)= 1.63
SEm± (Seed rate)=0.24, SEm± (Spacing)=0.30, SEm± (Seed rate × Spacing)= 0.53

K uptake by straw (kg/ha)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	32.87	38.92	37.84	36.54

75 kg ha^{-1}	35.56	44.62	38.73	39.64
90 kg ha^{-1}	28.19	39.06	32.14	33.13
Mean	32.20	40.87	36.24	

C.D.(5%)(Seed rate)=1.94, C.D.(5%)(Spacing)=3.38, C.D.(5%)(Seed rate × Spacing)= 5.79

SEm± (Seed rate)=0.48, SEm± (Spacing)=1.08, SEm± (Seed rate × Spacing)=1.88

Protein content in seed and straw (%)

Protein content in seed and straw recorded under different treatments have been presented in Table 8, which clearly indicates that plots sown at seed rate of 75 **kg/ha** with row spacing of 30 cm resulted insignificantly higher protein content in case of seed (23.04%) and straw (6.14%). The lowest protein content in seed (20.22%) and straw (5.15%) was obtained with the seed rate of 90 **kg/ha** and row spacing of 20cm. The similar result was quoted by Kumar *et al*. (2003).

Regarding different seed rate, maximum protein content in seed (22.70%) was obtained from the treatment of 75 **kg/ha** seed rate but was at par with seed rate of 60 **kg/ha** and 90 **kg/ha**, respectively. The maximum protein content in straw (5.88%) was obtained from the treatment of 75 **kg/ha** seed rate.

Regarding different row spacing, maximum protein content in seed (22.69%) and straw (5.90%) was obtained at 30cm row spacing, which was followed by row spacing of 40 cm and 20 cm, respectively. The above findings was in accordance with Ray *et al*. (2017). Higher values of proteins are obtained in the cases where N content is more as the protein content directly depends upon the value of N (Protein content= N content % × 6.25). The similar results was undertaken by Chauhan (2000).

Table 8 Effect of seed rate and spacing on Protein content (%) in seed and straw

Protein content in seed (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	22.08	22.87	22.49	22.48
75 kg ha^{-1}	22.35	23.04	22.72	22.70
90 kg ha^{-1}	20.22	22.16	20.24	22.87
Mean	21.55	22.69	21.82	

C.D.(5%)(Seed rate)=1.31, C.D.(5%)(Spacing)=0.54, C.D. (5%)(Seed rate × Spacing)= 0.93

SEm± (Seed rate)= 0.33, SEm± (Spacing)=0.17, SEm± (Seed rate × Spacing)=0.30

Protein content in straw (%)				
Treatments	20cm	30cm	40cm	Mean
60 kg ha^{-1}	5.40	5.80	5.69	5.63
75 kg ha^{-1}	6.76	6.14	5.75	5.88
90 kg ha^{-1}	5.15	5.77	5.63	5.52
Mean	5.44	5.90	5.69	

C.D.(5%)(Seed rate)=0.17, C.D.(5%)(Spacing)= 0.18, C.D.(5%)(Seed rate × Spacing)= 0.31

SEm± (Seed rate)=0.04, SEm± (Spacing)= 0.06, SEm± (Seed rate × Spacing)= 0.10

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