Int.J.Curr.Microbiol.App.Sci (2020) *9*(8): 3617-3625

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 9 Number 8 (2020)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2020.908.417

Assessment of Inner Wheel Intercropping of Linseed, Mustard and Chickpea in Wheat Crop

Ram Pyare[1*], V.K. Verma[1], Sanjeev Kumar[1], Shivani Singh[1], Amit Kumar[1] and Anjani Singh[2]

[1]Department of Agronomy, C.S.A. University of Ag. & Technology, Kanpur-208002, India
[2]Department of Agricultural Economics & Statistics, CSAUA&T, Kanpur (UP), India

**Corresponding author*

Keywords

Wheat, intercrops like Mustard, Linseed, Chickpea, raised bed, Flat bed, Inner wheel pattern

Article Info

Accepted:
26 July 2020
Available Online:
10 August 2020

A B S T R A C T

The experiments were conducted during two consecutive *Rabi* season of 2015-16 and 2016-17 at the Students Instructional Farm of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur-208002 (UP), India to find out the suitable intercropping system under inner wheel pattern. The experiment comprised ten treatments viz. Wheat + Mustard (1:1), Wheat + Mustard (2:1), Wheat + Linseed (1:1), Wheat + Linseed (2:1), Wheat + Chickpea (1:1) and Wheat + Chickpea (2:1) laid out in Randomized Block Design. Results showed that replicated three times in the intercropping treatments, wheat + chickpea (2:1) was find economically superior over remaining intercropping treatments during both the years in respect wheat crop/main crop. In case of inter crops significantly increased grains and straw yield among intercropping of row ratio (1:1) of Wheat + Mustard, Wheat + Linseed and Wheat + Chickpea, which was more over inter cropping of row ratio (2:1) of Wheat + Mustard, Wheat + Linseed and Wheat + Chickpea in both the year, respectively. The grain and straw yield of wheat were significantly higher in intercropping of wheat + chickpea (2:1) under inner wheel pattern followed by wheat + chickpea (1:1) treatments during both the years, respectively. The inter cropping of Wheat + Chickpea (2:1) in row ratio under inner wheel pattern was found superior in raised and flat bed system regarding on two year average wheat equivalent yield and land equivalent ratio over all remaining treatments during both the years, respectively. Whereas, economic aspect were significantly increased treatment of Wheat + Chickpea (1:1) compared to all treatment of main and inter crops system in both the years, respectively.

Introduction

Wheat (*Triticum aestivum* L.) is considered as king of cereal in the world and is grown on the largest area, in India during 2017-18, it is grown over an area of 29-58 million/ha and production 99.70 million tonnes having 3371 kg/ha productivity and other intercrops as pulses and oilseeds grow in over a production of 25.23 and 31.31 million tonnes, respectively (Anonymous 2018). Intercropping system is the broader context of food security and prevalent in many parts of world, particularly in Asia and Africa, due to

the rapid rise in cultivation one possible approach to resolve this problem would be to maximize the utilization of limited agriculture land through multiple cropping the increase productivity per unit area of available land. Intercropping which has been a common practice in developing countries is a important multiple cropping systems. Day by day due to rapid increase in the population the demand for food grain production also increases day by day rapidly, farmers are force to grow more and more food grain crops to fulfill this raising food demand of population. Growing, two or more than two crops or adopting intercropping system increases their cost of cultivation which is not affordable by marginal farmers. Inner wheel pattern is the new mechanised system of sowing crop which can be introduced in intercropping system with different inner wheel row ratio to mechanised system of intercropping which includes six rows in one inner wheel that is 20 cm distance from one row to another. The present study, therefore, undertake to find out the effect of inter cropping along with mustard, linseed, chickpea crops in different row ratio (1:1 & 2:1) in wheat crop under inner wheel pattern.

Materials and Methods

The field experiment were conducted at Students Instructional Farm of CSAUA&T, Kanpur during two years *Rabi* season of 2015-16 and 2016-17. The treatment comprised 10 treatments combination viz. wheat, mustard, linseed and chickpea alone crop and intercropping with row ratio viz. wheat + mustard (1:1), wheat + mustard (2:1), wheat + linseed (1:1), wheat + linseed (2:1), wheat + chickpea (1:1) and wheat + chickpea (2:1), which was laid out in Randomized Block Design with three replications. The soil of the experimental field was alluvial in texture as well as sandy loam soil with pH 7.4. The experimental crop was sown on 24 November, 2015 and 20 November, 2016 as per treatment under inner wheel pattern in raised bed and flat bed systems. The recommended seed rate for wheat 100 kg/ha, for mustard 2.0 kg/ha, for linseed 20 kg/ha and for chickpea 50 kg/ha were used. In intercropping the seed rate of the entire crop were reduced or used according to the numbers of row sown as per treatment. The row to row spacing of main crop (wheat) was 20 cm while sub-crop (intercrops) were sown at a row distance of 40 cm, only chickpea was sown on raised bed and remaining were sown on flat bed system. All the remaining package and practices for the cultivation of experimental crop was made as per recommendation. Main crop as wheat was harvested on 6 April, 2016 and 5 April, 2017 and all the sub crops were harvested when they attend their full maturity.

Results and Discussion

Yield attributes

The yield attributes of main crop as wheat viz. number of ear/plant and grains/plant has been presented in Table 1. A critical examination of data clearly indicated that the number of ear/plant was increased significantly in the inter cropping of wheat + chickpea (2:1) over rest other intercropping treatments during both the years, respectively. However, the maximum ear/plant was recorded in sole crop of wheat under inner wheel pattern row-ratio. The similar trend was also on grains/plants showed significantly variation due to intercropping treatment of wheat + chickpea with 2:1 row ratio compared to all remaining intercropping treatments during both the years, respectively, whereas, sole crop of wheat was statistically more under inner wheel pattern with row ratio in first and second year experimentation, respectively. Enhancement yield attributes under mustard, linseed and chickpea intercrops with wheat

under inner wheel pattern row ratio which contributed favourably to photosynthetic efficiency might be an account of higher used solar energy because of provided broader space as well as additional advantages of nitrogen fixation by root nodules of chickpea. The results were confirmed by Dhaka *et al.*, (2004).

The yield characters of inter crops like mustard, linseed and chickpea has been presented in Table 1. The silique per plant of mustard was very much influenced by different inner wheel patter row ratio as it is more in wheat + mustard (1:1) row ratio than wheat + mustard (2:1) inner wheel pattern row ratio. The similar trend was also on seeds/silique showed significantly variation due to inter cropping treatment of Wheat + Mustard (1:1) compared to treatment of Wheat + Mustard (2:1) during both the years, respectively, whereas, sole crop of mustard was statistically more under inner wheel pattern with row ratio in first and second year, experimentation, respectively. The capsules/plant and seeds/capsule of linseed were significantly variation among the inner wheel row ratio pattern of Wheat + Linseed (1:1) over next use of inter cropping of Wheat + Linseed (2:1) under inner wheel pattern with row-ratio during both the years, respectively. Whereas, sole crop of linseed was significantly more under inner wheel pattern with row ratio under flat bed system during both the years, respectively except first year in respect seeds/ capsule of linseed crop.

The inner wheel pattern with row-ratio of treatment of Wheat + Chickpea (1:1) was found significantly better than 2:1 row ratio of Wheat + Chickpea inter cropping whereas, sole crop of chickpea was significantly superior than both use of inter cropping treatment in first year experimentations but in second year, these observations were found non significantly by different inner wheel pattern with row-ratio under raised bed system of intercropping. The similar results were also on wheat + chickpea intercropping by Akhtar *et al.*, (2010).

The overall development in yield attributes of wheat in association with mustard, linseed and chickpea component crops owing to better nutritional and competition free environment led to increase in photosynthesis efficiency and translocation of photosynthates of words since grain and biomass might have resulted in higher grain yield. These results are in conformity with those of Kumaran and Seran (2007) reported low plant population.

Yields

The green yield and straw yield of wheat are presented in Table 2. The grain yield wheat was significantly increased at wheat + chickpea (2:1) row ratio compared to all remaining treatments under inner wheel patter of inter cropping but at par of wheat + mustard (1:1) intercropping during two years experimentation, respectively whereas, sole crop of wheat was significantly more than all rest treatments. The lowest grain yield of wheat (23.00 and 30.65 q/ha) was recorded under what + mustard (1:1) row ratio in inner wheel pattern of intercropping system during both the years, respectively. On the basis of two year data intercropped wheat grain produced significantly lower 23.00 q/ha (110%), 24.67 q/ha (95.78%), 23.92 q/ha (101.92%), 27.30 q/ha (76.92%), 30.02 q/ha (60.89%) and 31.70 q/ha (52.37%) in first year and 30.65 q/ha (95.07%), 35.26 q/ha (69.57%), 31.31 q/ha (92.96 %), 39.51 q/ha (51.33%), 40.45 q/ha (47.81%) and 41.17 q/ha (69.57%) in second year with intercropping as compared to sole crop of wheat (48.30 and 59.79 q/ha), respectively. The grain yield of wheat was more significant at intercropping of wheat + chickpea (2:1) than all remaining intercropping but at par

wheat + chickpea (1:1) during both the year, respectively. The straw yield of wheat increased by sole crop in different treatments sown significantly response similarly to that of grain yields during both the years, respectively. This effect might higher grain and biomass lesser competition of light, space, water and nutrients among the plants compare to other narrow space and shady crops led to increase in photo synthesis and translocation of photo synthates towards have resulted in finally grain yield. These results are in conformity with those of Kumaran and Seran (2007).

Table.1 Effect of intercropping on yield attributes of main crop and sub crops during 2015-16 and 2016-17

Treatment	Ear/plant			Grains/plant		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean
Main crop (Wheat)						
Wheat	7.63	8.85	8.24	55.60	53.65	54.63
W+M (1:1)	5.41	6.75	6.08	47.77	40.92	44.35
W+M (2:1)	6.63	7.55	7.09	49.54	45.77	47.66
W+L (1:1)	6.73	7.65	7.19	53.21	46.37	49.79
W+L (2:1)	5.30	6.90	6.1	52.33	45.83	49.08
W+C (1:1)	6.74	7.68	7.21	54.55	52.13	53.34
W+C (2:1)	7.40	8.60	8.00	52.55	46.56	49.56
SE(d)	**0.29**	**0.25**	-	**1.10**	**3.48**	-
CD at 5%	**0.64**	**0.54**	-	**2.40**	**7.58**	-
Sub crops (Mustard)	**Siliqua/plant**			**Seeds/sliliqua**		
Mustard	45.96	49.65	47.81	9.65	9.71	9.68
W + M (1:1)	41.08	42.15	41.62	8.74	8.80	8.77
W + M (2:1)	36.33	38.40	37.37	7.41	8.76	8.09
SE(d)	**1.404**	**2.53**	-	**0.387**	**0.15**	-
CD at 5%	**3.875**	**7.00**	-	**1.069**	**0.41**	-
Sub crops (Linseed)	**Capsules/plant**			**Seed/capsule**		
Linseed	217.73	221.73	219.73	9.30	9.25	9.28
W + L (1:1)	192.76	200.15	196.46	9.30	8.45	8.88
W + L (2:1)	173.83	195.75	184.79	8.30	7.95	8.13
SE(d)	**2.77**	**9.97**	-	**0.24**	**0.18**	-
CD at 5%	**7.65**	**N.S.**	-	**0.67**	**0.50**	-
Sub crops (Chickpea)	**Pods/plant**			**Grain/pod**		
Chickpea	16.20	16.75	16.48	1.66	1.59	1.63
W + C (1:1)	13.50	15.65	14.58	1.44	1.51	1.48
W + C (2:1)	9.80	14.75	12.28	1.22	1.49	1.36
SE(d)	**0.62**	**0.92**	-	**0.10**	**0.07**	-
CD at 5%	**1.73**	**N.S.**	-	**0.30**	**N.S.**	-

Table.2 Effect of intercropping on yields of main crop and sub crops during 2015-16 and 2016-17

Treatment	Grain yield			Straw yield		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean
Main crop (Wheat)						
Wheat	48.30	59.79	54.05	62.79	71.51	67.15
W+M (1:1)	23.00	30.65	26.83	25.63	42.60	34.12
W+M (2:1)	24.67	35.26	29.97	33.41	49.65	41.53
W+L (1:1)	23.92	31.31	27.62	34.95	45.84	40.40
W+L (2:1)	27.30	39.51	33.41	35.91	48.06	41.99
W+C (1:1)	30.02	40.45	35.24	38.03	47.18	42.61
W+C (2:1)	31.70	41.17	36.44	43.50	51.03	47.27
SE(d)	**1.08**	**4.32**	-	**1.85**	**5.08**	-
CD at 5%	**2.36**	**9.42**	-	**4.04**	**11.07**	-
Sub crops (Mustard)	**Grain yield**			**Straw yield**		
Mustard	21.39	22.19	21.79	57.84	59.93	58.89
W + M (1:1)	12.38	14.26	13.32	35.54	35.51	35.53
W + M (2:1)	9.08	10.01	9.55	29.91	30.05	29.98
SE(d)	**0.61**	**1.29**	-	**1.64**	**1.56**	-
CD at 5%	**1.70**	**3.57**	-	**4.53**	**4.34**	-
Sub crops (Linseed)	**Grain yield**			**Straw yield**		
Linseed	13.36	13.45	13.41	30.15	29.72	29.94
W + L (1:1)	6.87	6.93	6.90	17.41	17.60	17.51
W + L (2:1)	4.55	4.62	4.59	12.23	12.30	12.27
SE(d)	**0.43**	**1.02**	-	**1.05**	**0.85**	-
CD at 5%	**1.18**	**2.84**	-	**2.91**	**2.35**	-
Sub crops (Chickpea)	**Grain yield**			**Straw yield**		
Chickpea	23.24	21.95	22.60	27.17	26.17	26.67
W + C (1:1)	14.09	12.35	13.22	16.90	14.43	15.67
W + C (2:1)	11.89	8.75	10.32	13.91	10.57	12.24
SE(d)	**0.96**	**1.29**	-	**1.29**	**1.76**	-
CD at 5%	**2.66**	**3.58**	-	**3.58**	**4.90**	-

Table.3 Effect of intercropping on wheat equivalent yield and land equivalent ratio during 2015-16 and 2016-17

Treatment	W.E.Y. (q/ha)			L.E.R.		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean
Wheat	48.30	57.79	53.05	1.00	1.00	1.00
Mustard	44.10	51.16	47.63	1.00	1.00	1.00
Linseed	37.10	34.88	35.99	1.00	1.00	1.00
Chickpea	48.98	59.47	54.23	1.00	1.00	1.00
Wheat + Mustard (1:1)	48.52	63.53	56.03	1.06	1.02	1.04
Wheat + Mustard (2:1)	43.30	58.34	50.82	1.00	1.01	1.01
Wheat + Linseed (1:1)	42.94	48.88	45.91	1.08	1.05	1.07
Wheat + Linseed (2:1)	49.90	51.23	50.57	1.00	1.03	1.02
Wheat + Chickpea (1:1)	59.72	73.90	66.81	1.20	1.09	1.15
Wheat + Chickpea (2:1)	72.42	65.11	68.77	1.24	1.28	1.26
SE(d)	**1.26**	**2.80**	-	**0.258**	**0.04**	-
CD at 5%	**2.66**	**5.90**	-	**0.471**	**0.09**	-

Table.4 Effect of intercropping on economics as gross income, net income and B:C ratio during 2015-16 and 2016-17

Treatment	Gross income			Net income			B:C ratio		
	2015-16	2016-17	Mean	2015-16	2016-17	Mean	2015-16	2016-17	Mean
Wheat	97373	100266	98819.50	45548	60767	53157.50	1.88	2.53	2.21
Mustard	77440	81763	79601.50	35436	62509	48972.50	1.84	2.11	1.98
Linseed	63135	60517	61826.00	22535	37823	30179.00	1.55	1.60	1.58
Chickpea	88172	86811	87491.50	44072	68176	56124.00	1.99	2.13	2.06
W + M (1:1)	90091	110225	100158.00	37011	64459	50735.00	1.69	2.40	2.05
W + M (2:1)	83520	101220	92370.00	30721	60250	45485.50	1.58	2.30	1.94
W + L (1:1)	82011	84807	83409.00	29211	61903	45557.00	1.55	1.37	1.46
W + L (2:1)	76834	85884	81359.00	25133	64038	44585.50	1.48	2.08	1.78
W + C (1:1)	114735	128217	121476.00	60210	73267	66738.50	2.10	2.79	2.45
W + C (2:1)	111125	104096	107610.50	57715	64790	61252.50	2.08	2.34	2.21
SE(d)	**900.03**	**2832.88**	-	**800.90**	**1463.93**	-	**0.03**	**0.38**	-
CD at 5%	**1900.12**	**5953.69**	-	**1700.29**	**3074.55**	-	**0.08**	**1.68**	-

The grain and straw yields of inter crops viz. mustard, linseed and chickpea are presented in Table 2. The grain and straw yield of mustard were significantly increased in Wheat + Mustard (1:1) which was more than Wheat + Mustard (2:1) row ratio under inner wheel pattern of intercropping but without intercropping due to sole crop were found significantly higher observed over both inter cropping of Wheat + Mustard (1:1) and (2:1) under inner wheel patter of both year study, respectively. It was found 8.47 q/ha (63.59%) and 12.24 q/ha (128.17%) in grain yield and 23.36 q/ha (65.75%) and 28.9 q/ha (96.43%), in straw yield higher than intercropping treatment of Wheat + Mustard (1:1) and (2:1) row ratio, respectively. The grain and straw yield of linseed were significantly increased intercropping of Wheat + Linseed (1:1) row-ratio which was more than Wheat + Linseed (2:1) row ratio under different inner wheel patter of intercropping during both the year of

study, respectively. Without intercropping due to sole crop was found significantly higher observed than both intercropping as Wheat + Mustard of 1:1 and 2:1 row ratio under inner wheel pattern during both the years, respectively by a margin of 6.51 q/ha (94.35%) and 8.82 q/ha (192.16%) in grain yield and 12.43 q/ha (70.99%) and 17.67 q/ha (144.01%) in straw yield more over Wheat + Linseed (1:1) and Wheat + Linseed (2:1) treatment, respectively. The similar trend was also on grain yield and straw yield of sub crop as chickpea showed significantly variation due to intercropping treatment of Wheat + Chickpea with 1:1 row ratio compared to 2:1 row ratio intercropping treatment during both the years, respectively. Whereas, the sole crop were noted significantly more than intercropping of 1:1 and 2:1 row ratio of Wheat + Chickpea intercropping during both the years of study, respectively. The increment evaluated in grain yield of 9.38 q/ha (70.95%) and 12.28 q/ha (118.99%) and in straw yield of 11.00 q/ha (70.20%) and 14.43 q/ha (117.89%) resulted into low yield in respect to Wheat + Chickpea (1:1) and Wheat + Chickpea (2:1) intercropping treatment compared to sole crop of chickpea, respectively. The similar results were also on Wheat + Chickpea intercropping by Akhtar *et al.,* (2010).

This effects may be explain as the shade effect of mustard on wheat and other reasons of few other intercrops which might have enhances the above observations in relations to intercropping. Therefore, based on the available literature on intercropping of mustard with wheat or other related winter crops, it may be concluded unanimously that the deviated from their respective solid stands. This could be probably due to reduced seed rate and inter space completion between them for light, space, water and nutrients growing to each other which have resulted in finally grain & biomass yield. The results are in conformity with the findings of Khan *et al.,* (2005) and Srivastava and Bohra *et al.,* (2006).

Wheat equivalent yield

The presented in Table 3 noted that intercrops affected the wheat equivalent yield of the system was significantly improved. The highest wheat equivalent yield (72.42 q/ha) was recorded under Wheat + Chickpea with 2:1 ratio of inner wheel pattern significantly followed by 1:1 ratio of Wheat + Chickpea (59.72 q/ha) in first year, whereas, in second year, wheat equivalent yield (72.90 q/ha) was more noted under intercropping treatment of Wheat + Chickpea (1:1) significantly followed by 2:1 ratio of Wheat + Chickpea intercropping treatment. The minimum wheat equivalent yield was recorded alone linseed crop (37.10 & 34.88 q/ha) under inner wheel pattern of intercropping during both the years, respectively. On an average, applied of wheat + chickpea (2:1) intercropping treatment increased the wheat equivalent yield to the tune of 15.72 q/ha (29.63%), 21.14 q/ha (44.38%), 32.78 q/ha (91.08%), 14.54 q/ha (26.81%), 12.74 q/ha (22.74%), 17.95 q/ha (35.32%), 22.86 q/ha (49.79%), 18.20 q/ha (35.99%) and 1.96 q/ha (2.93%) over alone crop of wheat, mustard, linseed & chickpea and intercropping of wheat + mustard (1:1), wheat + mustard (2:1), wheat + linseed (1:1), wheat + linseed (2:1) and wheat + chickpea (1:1), respectively. The similar findings were reported by Prasad *et al.*, 2006, Pyare *et al.*, 2008, Das *et al.*, 2011 and Srivastava *et al.*, 2016.

Economics

The result pertaining to economics as gross income net income and B:C ratio influence by inner wheel pattern row ratio under raised bed and flat bed system are presented in Table 4. The treatment of Wheat + Chickpea (1:1) row

ratio were increased, significantly gross income and net return (Rs./ha) over all treatment of alone and intercropping in both the years, respectively whereas, the minimum gross and net income were recorded with alone linseed crop during both the years, respectively by a margin of Rs.22656.50/ha (22.93%), Rs.41874.50/ha (52.61%), Rs.59650.00/ha (96.48%), Rs.33984.50/ha (38.84%), Rs.21318.00/ha (21.28%), Rs.29106.00/ha (31.51%), Rs.38067.00/ha (45.64%), Rs.40117.00/ha (49.31%), and Rs.13865.50/ha (12.88%), in gross income and Rs.13581.00/ha (25.55%), Rs.17766.00/ ha (36.28%), Rs.36559.50/ha (121.14%), Rs.10614.50/ha (18.91%), Rs.16003.50/ha (31.54%), Rs.21253.00/ha (46.72%), Rs.21181.50/ha (46.49%), Rs.22153.00/ha (49.69%), and Rs.5486.00/ha (8.97%) in net return higher compared to all alone crops and rest intercropping treatments during both the years, respectively. The similar trend were also on B:C ratio showed significantly variation due to intercropping treatment of Wheat + Chickpea (1:1) compared to treatment of alone crops and remaining inter cropping during both the years, respectively. It was found 0.24, 0.47, 0.87, 0.39, 0.40, 0.51, 0.99, 0.67 and 0.24 benefit cost ratio higher than all alone crops and treatment of intercropping during both the years, respectively. The better performance of intercropping treatment, it might be due to the higher productivity in the system it might be done to lower cost of cultivation in this treatment. Rahman *et al.*, (2009) reported the intercropping of 1:1 and 1:2 row ratio were found better profitable production.

References

Akhtar, M; Yaqub, M., Iqbal, Z.; Ashraf, M.Y., Akhtar and Hussain, R (2010). Improvement in yield and nutrient uptake by Co-cropping of wheat and chickpea, *Pak. J. Boit* 42:4043-49.

Anonymous (2018) area, production and yield of principal crops, *Directorate of Economics & Statistics, DAC & FW,* Page: 65 & 79.

Das, A.K., Haider, M.L. and Khaliq Q.A. (2011). Effect of intercropping on growth and yield in Wheat + Lentil and Wheat + chickpea intercropping system at different planting configurations, *J. Innov. Dev. Strategy* 5:125-137.

Dhaka A, Rajput R.S., Mishra P.K., Sarawgi S.K. and Joshi B.S. (2004). Effect of crop geometry and nitrogen management on yield and yield attributes of wheat + chickpea intercropping system. *Ann Agric Res* 25: 567-70.

Khan M., Khan R.U., Wahab A and Rashid A (2005). Yield and yield components of wheat as influenced by intercropping of chickpea, lentil and rapeseed in different proportions. *Pak. J. Agric. Sci*. 42:3-4.

Kumaran. J. and Seran T.H. (2007). Studies on intercropping Capsicum with bushitao proceeding of the 6th Annual Research Session, Oct. 18-19, Trincomalee Campus, EUSL. pp. 432-440.

Prasad, K., Singh, R.K. and Pyare (2006). Studies on intercropping of mustard varieties with chickpea. *Indian Journal of Pulses Research* 19(1): 73-75.

Pyare Ram, Prasad, K. Kumar, S., Tiwari R.K. and Sonkar T.C. (2008). Production potential and economics of lentil and mustard in mixed and intercropping system. *Plant Archives* 8(1): 233-236.

Rahman, Awal M.M., Amin M.A. and Parvez M.R. (2009). Compatibility growth and production potential of mustard of lentil intercrops. *International Journal of Bombay* 5(1): 100-106.

Srivastava, A.K. Singh, Vishram, Verma,

V.K., Chaudhary, Sanjai, Pyare, R., Verma, B.K. and Parihar (2016). Economic viability of citronella (*Cymbopogon winterianus*) based intercropping system in citronella plain zone of Uttar Pradesh. *International Research Journal of Natural and applied Sciences,* (4):136-150.

Srivastava, R.K. and Bohra J.S. (2006). Performance of wheat + Indian mustard intercropping in relation to row ratio, Indian Mustard variety and fertility levels. *Indian. J. Agron.* 51:107-111.

How to cite this article:

Ram Pyare, V.K. Verma, Sanjeev Kumar, Shivani Singh, Amit Kumar and Anjani Singh. 2020. Assessment of Inner Wheel Intercropping of Linseed, Mustard and Chickpea in Wheat Crop. *Int.J.Curr.Microbiol.App.Sci.* 9(08): 3617-3625. doi: https://doi.org/10.20546/ijcmas.2020.908.417