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Effect on barley based intercropping systems as influenced by integrated nutrient management on growth and development under rainfed condition

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Abstract
A field experiment was conducted during *rabi* seasons of 2017-18 and 2018-19 at Soil Conservation and Water Management Farm of CS Azad University of Agriculture and Technology, Kanpur to find out suitable row ratio of barley + lentil/chickpea in intercropping systems under rainfed condition. The results revealed that plant height, branches flowering and maturity stages barley performed better in intercropping than sole cropping. Among different cropping systems, Barley + Chickpea (2:1) in case of integrated nutrient management 75% RDN + 25% N through FYM + culture + PSB exhibited maximum root development during the two years of experimentation.

Keywords: Plant height, branches and flowering & maturity, rainfed, integrated nutrient management

Introduction
Barley (*Hordeum vulgare* L.) member of grasses family, it is a self-pollinated, diploid species with 14 chromosome number. It is a major cereal grain grown in temperate climates. It was one of the first cultivated grains, particularly in Eurasia as early as 10,000 year ago. Barley has been used as animal fodder, as a source of fermentable material for beer and certain distilled beverages, and as a compound of various health foods (Malcolmson *et al.*, 2015) [5]. Each 100 g of barley grain comprises 10.6 g protein, 2.1 g fat, 64.0 g carbohydrate, 50.0 mg calcium, 6.0 mg iron, 31 mg vitamin B_1, 0.10 mg vitamin B2 and 50 µg folate (Vaughan *et al.*, 2018) [8]. High protein barley is suited for animal feed. Malting barley is usually lower protein. Barley is the fourth largest cereal crop after maize, rice and wheat with 132 million tonnes produced annually. In India, barley was cultivated on 0.66 m ha^{-1} area during 2018-19 with 1.62 million tonnes of production at an average productivity status of 24.7q ha^{-1} (FAO, 2019) [2] Uttar Pradesh, it is have the third position with area 0.223 million ha^{-1} and production of 0.620 million tonnes with productivity of 2,774 kg ha^{-1}. This production is far below that of most of the states like Haryana (0.137 million tonnes), Punjab (0.047 million ton) and Jammu and Kashmir (0.008 million ton). The production of barley can be increased either by increasing more area under cultivation or by increasing yield per unit area (Malcolmson *et al.*, 2015) [5].
Barley is tolerant to saline water and sodic soil. Salinity is the concentration of dissolved salts in water or soil and is expressed in terms of concentration (mg L^{-1}) or electrical conductivity (dS m^{-1}). According to Grewal (2015) [3] salinity is one of the major a biotic environmental stresses affecting agricultural productivity. Nearly 7% of world's total land area is affected by salinity. Salinity affects many morphological, physiological and biochemical processes, including seed germination, plant growth, water and nutrient uptake (Musyimi *et al.*, 2017) [6]. Reduced yield and grain quality. However, plant species differ in their sensitivity or tolerance to salts (Basalah, 2019) [1].

Materials and Methods
A field experiment was conducted during *rabi* seasons of 2017-18 and 2018-19 at Soil Conservation and Water Management Farm of CS Azad University of Agriculture and Technology, Kanpur in alluvial soil under rainfed condition. The soil of the experimental field was sandy loam in texture and slightly calcareous having organic carbon 0.31%, total nitrogen 0.032%, available P_2O_5 16.5 kg ha^{-1}, available K_2O 156.2 kg ha^{-1}, pH 7.5, electrical conductivity 0.35 dS m^{-1}, water holding capacity 29.7%, Bulk density 1.44 Mg m^{-1}, Particle density 2.54 Mg m^{-1} and porosity 56.69%.

The field experiment was conducted in split plot design with three replications, keeping cropping systems in main plots and INM in subplots. The treatment comprising 7 cropping systems *viz.* C_1: Barley sole, C_2: Lentil sole, C_3: Chickpea sole, C_4: Barley + lentil (2:1), C_5: Barley + lentil (4:1), C_6: Barley + Chickpea (2:1) and C_7: Barley + Chickpea (4:1) and 3 integrated nutrient management *viz.* N_1: RDN, N_2: 75% RDN + 25% N through FYM and N_3: 75% RDN + 25% N through FYM + culture + PSB. Crops were sown on 30.11.2017 and 01.12.2018 during the first and second year of experimentation, respectively. Available moisture at sowing time up to 100 cm soil profile was measured which was 281.7 and 277.5 mm. The amount and distribution of rainfall received during cropping season was 23.3 and 28.2 mm in 2017-18 and 2018-19, respectively against the average annual rainfall of about 800 mm. Recommended package of practices and fertilizers doses were applied in different treatments.

Results and Discussion

The information on plant height, branches, flowering and maturity stages of barley, lentil and chickpea for different treatments indicated that the plant height, branches, flowering and maturity stages was significantly influenced by the different treatments over the periods of experimentation (Table-1-11). Plant height, branches, flowering and maturity stages was significantly highest under Barley + Chickpea (2:1) followed by Barley + Chickpea (4:1) whereas lowest plant height, branches, flowering and maturity stages was obtained in the treatment of barley sole among different cropping systems during two different years. Application of 75% RDN + 25% N through FYM + culture + PSB brought about significantly highest plant height, branches, flowering and maturity stages and lowest values under RDN might be due to integrated application of fertilizers and organic sources has been also reported by Verma *et al.* (2017) [9], Verma *et al.* (2018) [10] Kumar *et al.* (2018) [4] and Singh *et al.* (2019) [7].

Table 1: Effect of cropping systems and integrated nutrient management on plant height (cm) of barley at different stages

Cropping systems	2017-18				2018-19			
	Integrated nutrient management			Mean	Integrated nutrient management			Mean
	RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB		RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB	
30 DAS								
Barley sole	15.4	16.1	16.6	16.0	17.0	17.6	18.0	17.5
Barley + lentil (2:1)	16.4	16.8	17.8	17.0	18.3	18.7	19.7	18.9
Barley + lentil (4:1)	16.0	16.5	16.8	16.4	17.8	18.2	18.4	18.1
Barley + chickpea (2:1)	16.6	17.7	17.9	17.4	18.2	19.3	19.5	19.0
Barley + chickpea (4:1)	16.4	16.7	17.0	16.9	18.5	18.8	19.1	18.8
Mean	16.2	16.8	17.2		18.0	18.5	18.9	
	Cropping systems (C)		Integrated nutrient management (N)	C×N	Cropping systems (C)		Integrated nutrient management (N)	C×N
SE (d)	0.4		0.5	1.2	0.6		0.6	1.3
CD (P=0.05)	NS		NS	NS	NS		NS	NS
60 DAS								
Barley sole	62.4	67.9	75.3	68.5	63.3	70.2	78.8	70.8
Barley + lentil (2:1)	65.0	71.8	79.6	72.1	66.4	73.9	82.9	74.4
Barley + lentil (4:1)	64.5	69.7	77.9	70.7	65.8	72.0	81.2	73.0
Barley + chickpea (2:1)	67.8	73.1	81.9	74.3	69.3	75.7	85.4	76.8
Barley + chickpea (4:1)	66.7	70.9	79.2	72.3	67.9	73.4	82.6	74.6
Mean	65.3	70.7	78.8		66.5	73.0	82.2	
	Cropping systems (C)		Integrated nutrient management (N)	C×N	Cropping systems (C)		Integrated nutrient management (N)	C×N
SE (d)	1.4		1.5	3.3	1.5		1.6	3.7
CD (P=0.05)	3.2		3.1	NS	3.5		3.4	NS

Table 2: Effect of cropping systems and integrated nutrient management on plant height (cm) of barley at different stages

Cropping systems	2017-18				2018-19			
	Integrated nutrient management			Mean	Integrated nutrient management			Mean
	RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB		RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB	
90 DAS								
Barley sole	75.5	81.8	89.5	82.3	77.7	84.9	93.4	85.3
Barley + lentil (2:1)	79.1	86.3	94.5	86.6	81.6	89.6	98.8	90.0
Barley + lentil (4:1)	78.3	83.9	92.6	84.9	80.6	87.0	96.9	88.2
Barley + chickpea (2:1)	82.7	88.7	98.1	89.8	84.9	91.9	102.4	93.1
Barley + chickpea (4:1)	81.1	85.7	94.5	87.1	83.6	88.9	98.9	90.5
Mean	79.3	85.3	93.8		81.7	88.5	98.1	
	Cropping systems (C)	Integrated nutrient management (N)	C×N		Cropping systems (C)		Integrated nutrient management (N)	C×N
SE (d)	1.7	1.8	4.1		1.8		1.9	4.4
CD (P=0.05)	3.9	3.7	NS		4.2		4.1	NS
At maturity								
Barley sole	76.7	83.1	90.7	83.5	80.5	86.6	94.1	87.1

Barley + lentil (2:1)	80.4	87.8	95.9	88.0	84.5	91.9	99.6	92.0
Barley + lentil (4:1)	79.7	85.4	93.8	86.3	83.2	88.8	97.7	89.9
Barley + chickpea (2:1)	83.9	90.2	99.9	91.3	87.7	94.0	102.6	94.8
Barley + chickpea (4:1)	82.4	87.0	96.8	88.7	86.8	90.7	99.5	92.3
Mean	80.6	86.7	95.4		84.5	90.4	98.7	
	Cropping systems (C)	**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**			**Integrated nutrient management (N)**	**C×N**
SE (d)	1.9	2.1	4.7	2.0			2.1	4.9
CD (P=0.05)	4.4	4.4	NS	4.6			4.5	NS

Table 3: Effect of cropping systems and integrated nutrient management on plant height (cm) of lentil at different stages

Cropping systems	**2017-18**				**2018-19**			
	Integrated nutrient management			**Mean**	**Integrated nutrient management**			**Mean**
	RDF	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**		**RDF**	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**	
30 DAS								
Lentil sole	6.8	7.1	7.0	6.9	7.0	7.2	7.3	7.2
Barley + lentil (2:1)	7.1	7.5	7.5	7.3	7.3	7.4	7.6	7.4
Barley + lentil (4:1)	7.4	7.7	7.9	7.6	7.5	7.8	7.9	7.7
Mean	7.1	7.4	7.5		7.3	7.5	7.6	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.2		0.4	0.6	0.3		0.4	0.7
CD (P=0.05)	NS		NS	NS	NS		NS	NS
60 DAS								
Lentil sole	19.7	22.9	26.4	23.0	20.8	24.1	27.7	24.2
Barley + lentil (2:1)	23.1	26.4	29.7	26.4	24.5	27.6	31.3	27.8
Barley + lentil (4:1)	25.6	29.0	32.1	28.9	27.0	30.8	33.7	30.5
Mean	22.8	26.1	29.4		24.1	27.5	30.9	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	1.0		1.5	2.5	1.0		1.6	2.8
CD (P=0.05)	2.7		3.2	NS	2.9		3.5	NS

Table 4: Effect of cropping systems and integrated nutrient management on plant height (cm) of lentil at different stages

Cropping systems	**2017-18**				**2018-19**			
	Integrated nutrient management			**Mean**	**Integrated nutrient management**			**Mean**
	RDF	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**		**RDF**	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**	
90 DAS								
Barley sole	22.5	26.0	29.8	26.1	23.6	27.7	31.8	27.7
Barley + lentil (2:1)	26.1	29.6	33.7	29.8	27.2	30.8	34.9	31.0
Barley + lentil (4:1)	28.5	32.6	36.4	32.5	28.6	32.8	36.7	32.7
Mean	25.7	29.4	33.3		26.5	30.4	34.5	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	1.3		1.4	0.9	1.4		1.4	2.5
CD (P=0.05)	3.6		3.0	NS	3.7		3.1	NS
At maturity								
Barley sole	23.44	26.8	30.7	27.0	24.3	28.6	32.9	28.6
Barley + lentil (2:1)	26.9	30.5	34.5	30.6	28.0	31.8	36.2	32.0
Barley + lentil (4:1)	29.2	33.4	37.3	33.3	29.5	33.9	38.0	33.8
Mean	26.5	30.2	34.2		27.3	31.4	35.7	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	1.3		1.4	2.4	1.4		1.5	2.6
CD (P=0.05)	3.6		3.0	NS	3.9		3.2	NS

Table 5: Effect of cropping systems and integrated nutrient management on plant height (cm) of chickpea at different stages

Cropping systems	2017-18				2018-19			
	Integrated nutrient management			Mean	Integrated nutrient management			Mean
	RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB		RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB	
30 DAS								
Chickpea sole	9.1	9.3	9.3	9.2	8.9	9.0	9.2	9.0
Barley + chickpea (2:1)	9.3	9.6	9.7	9.5	9.4	9.5	9.6	9.5
Barley + chickpea (4:1)	9.4	9.7	9.8	9.6	9.4	9.8	9.9	9.7
Mean	9.3	9.5	9.6		9.2	9.4	9.6	
	Cropping systems (C)	Integrated nutrient management (N)	C×N		Cropping systems (C)	Integrated nutrient management (N)	C×N	
SE (d)	0.3	0.3	0.5		0.3	0.3	0.5	
CD (P=0.05)	NS	NS	NS		NS	NS	NS	
60 DAS								
Chickpea sole	21.2	24.8	28.1	24.7	22.3	26.1	29.6	26.0
Barley + chickpea (2:1)	24.1	27.4	31.3	27.6	25.3	28.8	33.1	29.1
Barley + chickpea (4:1)	25.1	28.5	32.5	28..7	26.4	30.0	34.6	30.3
Mean	23.5	26.9	30.6		24.7	28.3	32.4	
	Cropping systems (C)	Integrated nutrient management (N)	C×N		Cropping systems (C)	Integrated nutrient management (N)	C×N	
SE (d)	0.8	0.9	1.6		0.9	0.9	1.6	
CD (P=0.05)	2.3	2.0	NS		2.4	2.0	NS	
90 DAS								
Chickpea sole	27.4	32.1	36.2	31.9	29.6	34.6	39.4	34.5
Barley + chickpea (2:1)	31.5	36.2	40.6	36.1	33.0	37.8	43.3	38.0
Barley + chickpea (4:1)	33.0	37.7	42.1	37.1	34.2	39.2	44.9	39.4
Mean	30.6	35.3	39.6		32.3	37.2	42.5	
	Cropping systems (C)	Integrated nutrient management (N)		C×N	Cropping systems (C)	Integrated nutrient management (N)		C×N
SE (d)	1.1	1.1		2.0	1.1	1.2		2.1
CD (P=0.05)	2.9	2.5		NS	3.0	2.7		NS

Table 6: Effect of cropping systems and integrated nutrient management on plant height (cm) of chickpea at different stages

Cropping systems	2017-18				2018-19			
	Integrated nutrient management			Mean	Integrated nutrient management			Mean
	RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB		RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB	
120 DAS								
Chickpea sole	30.0	34.8	39.8	34.9	31.5	37.9	42.7	37.4
Barley + chickpea (2:1)	33.0	40.0	44.8	39.3	36.3	41.2	46.8	41.4
Barley + chickpea (4:1)	34.3	41.3	46.1	40.6	37.5	42.7	48.4	42.9
Mean	32.4	38.7	43.6		35.1	40.6	46.0	
	Cropping systems (C)		Integrated nutrient management (N)	C×N	Cropping systems (C)	Integrated nutrient management (N)		C×N
SE (d)	1.2		1.3	2.3	1.2	1.4		2.4
CD (P=0.05)	3.3		2.9	NS	3.4	3.0		NS
At maturity								
Chickpea sole	30.0	34.9	40.0	35.0	31.6	38.2	42.9	37.6
Barley + chickpea (2:1)	33.0	40.0	44.9	39.3	36.3	41.3	46.9	41.5
Barley + chickpea (4:1)	34.3	41.5	46.3	40.7	37.7	43.0	48.6	43.1
Mean	32.4	38.8	43.7		35.2	40.8	46.1	
	Cropping systems (C)		Integrated nutrient management (N)	C×N	Cropping systems (C)	Integrated nutrient management (N)		C×N
SE (d)	1.2		1.3	2.3	1.3	1.4		2.4
CD (P=0.05)	3.3		2.9	NS	3.5	3.0		NS

Table 7: Effect of cropping systems and integrated nutrient management on primary branches plant^{-1} of lentil

Cropping systems	2017-18				2018-19			
	Integrated nutrient management			Mean	Integrated nutrient management			Mean
	RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB		RDF	75% RDN + 25% N through FYM	75% RDN + 25% N through FYM + culture + PSB	
60 DAS								
Lentil sole	4.4	4.7	5.8	5.0	4.3	4.7	5.9	5.0

Barley + lentil (2:1)	3.3	3.8	4.2	3.8	3.1	3.7	4.3	3.7
Barley + lentil (4:1)	2.8	3.4	3.9	3.4	2.8	3.5	3.8	3.4
Mean	3.5	4.0	4.6		3.4	4.0	4.7	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.3		0.4	0.7	0.3		0.4	0.6
CD (P=0.05)	1.0		0.9	NS	0.9		0.8	NS
90 DAS								
Lentil sole	6.1	6.7	7.9	6.9	6.3	7.0	8.3	7.2
Barley + lentil (2:1)	4.7	5.5	6.0	5.4	4.8	5.6	6.3	5.6
Barley + lentil (4:1)	4.1	5.1	5.5	4.9	4.2	5.0	5.7	5.0
Mean	5.0	5.8	6.5		5.1	5.9	6.8	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.5		0.5	0.8	0.5		0.5	1.0
CD (P=0.05)	1.3		1.0	NS	1.4		1.2	NS
At maturity								
Lentil sole	6.2	7.0	8.1	7.1	6.3	7.1	8.5	7.3
Barley + lentil (2:1)	4.7	5.7	6.3	5.6	4.8	5.8	6.4	5.7
Barley + lentil (4:1)	4.1	5.3	5.7	5.0	4.2	5.1	5.7	5.0
Mean	5.0	6.0	6.7		5.1	6.0	6.9	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.5		0.5	0.9	0.6		0.6	1.0
CD (P=0.05)	1.4		1.1	NS	1.5		1.2	NS

Table 9: Effect of cropping systems and integrated nutrient management on days of flowering and maturity of barley

Cropping systems	**2017-18**				**2018-19**			
	Integrated nutrient management			**Mean**	**Integrated nutrient management**			**Mean**
	RDF	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**		**RDF**	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**	
Days of flowering								
Barley sole	61	63	66	63.3	62	65	66	64.3
Barley + lentil (2:1)	62	67	68	65.7	64	66	68	66.0
Barley + lentil (4:1)	62	66	67	65.0	63	66	67	65.3
Barley + chickpea (2:1)	63	67	69	66.3	65	67	69	67.0
Barley + chickpea (4:1)	63	67	68	66.0	64	67	68	66.3
Mean	62.2	66.0	67.6		63.6	66.2	67.6	
	Cropping systems (C)	**Integrated nutrient management (N)**		**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.6	0.7		1.6	0.7		0.8	1.8
CD (P=0.05)	1.5	1.5		NS	1.7		1.7	NS
Days of maturity								
Chickpea sole	113	115	116	114.7	113	116	117	115.3
Barley + lentil (2:1)	114	117	118	116.3	114	118	118	116.7
Barley + lentil (4:1)	113	116	116	115.0	114	117	117	116.0
Barley + chickpea (2:1)	114	117	119	116.7	116	118	119	117.7
Barley + chickpea (4:1)	114	117	118	116.3	115	117	118	116.7
Mean	113.6	116.4	117.4		114.4	117.2	117.8	
	Cropping systems (C)	**Integrated nutrient management (N)**		**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.6	0.7		1.6	0.6		0.6	1.4
CD (P=0.05)	1.5	1.5		NS	1.3		1.3	NS

Table 10: Effect of cropping systems and integrated nutrient management on days to flowering and maturity of lentil

Cropping systems	**2017-18**				**2018-19**			
	Integrated nutrient management			**Mean**	**Integrated nutrient management**			**Mean**
	RDF	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**		**RDF**	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**	
days of flowering								
Lentil sole	62	64	65	63.7	62	65	66	64.3
Barley + lentil (2:1)	63	66	67	65.3	63	66	68	65.7
Barley + lentil (4:1)	64	67	68	66.3	63	68	70	67.0
Mean	63.0	65.7	66.7		62.7	66.3	68.0	
	Cropping systems (C)		**Integrated nutrient**	**C×N**	**Cropping systems (C)**		**Integrated nutrient**	**C×N**

			management (N)				management (N)	
SE (d)	0.6		0.7	1.3	0.6		0.8	1.3
CD (P=0.05)	1.7		1.6	NS	1.8		1.7	NS
Days of maturity								
Lentil sole	114	116	117	115.7	115	117	118	116.7
Barley + lentil (2:1)	116	117	118	117.0	116	118	120	118.0
Barley + lentil (4:1)	116	117	119	117.3	117	119	120	118.7
Mean	115.3	116.7	118.0		116.0	118.0	119.3	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.8		0.8	1.4	1.0		1.1	1.9
CD (P=0.05)	NS		1.8	NS	NS		2.4	NS

Table 11: Effect of cropping systems and integrated nutrient management on days to flowering and maturity of chickpea

Cropping systems	**2017-18**				**2018-19**			
	Integrated nutrient management			**Mean**	**Integrated nutrient management**			**Mean**
	RDF	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**		**RDF**	**75% RDN + 25% N through FYM**	**75% RDN + 25% N through FYM + culture + PSB**	
days of flowering								
Chickpea sole	80	82	83	81.7	80	83	85	82.6
Barley + chickpea (2:1)	81	83	84	82.7	81	84	85	83.3
Barley + chickpea (4:1)	81	83	85	83.0	82	85	86	84.3
Mean	80.7	82.7	84.0		81.0	84.0	85.3	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.5		0.6	1.0	0.8		0.8	1.4
CD (P=0.05)	NS		1.2	NS	NS		1.8	NS
Days of maturity								
Chickpea sole	129	131	132	130.7	130	132	133	131.7
Barley + chickpea (2:1)	130	131	133	131.3	130	133	135	132.6
Barley + chickpea (4:1)	130	132	134	132.0	131	132	136	133.0
Mean	129.7	131.3	133		130.3	132.3	134.7	
	Cropping systems (C)		**Integrated nutrient management (N)**	**C×N**	**Cropping systems (C)**		**Integrated nutrient management (N)**	**C×N**
SE (d)	0.6		0.6	1.0	0.8		0.8	1.4
CD (P=0.05)	NS		1.3	NS	NS		1.8	NS

Conclusion

Based on two years of experiment it may be inferred that Barley + Chickpea (2:1) supplemented with 75% RDN + 25% N through FYM + culture + PSB showed good plant height, branches for sustainable flowering and maturity stages and proved to be quite remunerative in rainfed alluvial tract of Uttar Pradesh.

References

1. Basalah MO. Action of salinity on seed germination and seedling growth of (*Solanum melongena* L.). Journal of Agricultural Research Kafer El-Sheikh University 2019;36(4):64-73.
2. FAO, 2019. http://www.fao.org/faostat/ en/#data/QC.
3. Grewal HS. Water uptake, water use efficiency, plant growth and ionic balance of wheat, barley, canola and chickpea plants on a sodic vertical with variable subsoil NaCl salinity. Agriculture Water Management 2015;97(3):148-156.
4. Kumar SS, Singh RK, Yadav MN. Production potential and returns of barley intercropping systems under rainfed conditions of Haryana. Indian Journal of Environmental Sciences 2018;21(1):125-132.
5. Malcolmson N, Nowkirkm R, Carson G. Expanding opportunities for barley food and geed through product innovation. Feed and food quality; 18th National American Barley Research Workshop 4th Canadian Barley Symposium 2015, 2-4.
6. Musyimi DM, Netondo GW, Ouma G. Effects of salinity on growth and Photosynthesis of avocado seedling. International Journal of Botany 2017;4(3):78-84.
7. Singh DP, Rajput AL, Singh SK. Productivity and economics of barley based cropping system. Indian Journal of Environmental Sciences 2019;34(5):67-78.
8. Vaughan JG, Judd PA, Bellamy D. The oxford book of health foods. A comprehensive guide to natural remedies Publisher Oxford University-press great clarendon street, Oxford 2018. http://books.google.co.in/books pp-37.
9. Verma Amar Kant, Yadav PN, Awasthi UD. Studies on Linseed (*Linum usitatissimum* L.) based Intercropping Systems as Influenced by Integrated Nutrient Management on Yield and Economics under Moisture Scarce Condition. Int. J Curr. Microbiol. App. Sci. 2017;6(11):2309-2314. doi: https://doi.org/10.20546/ijcmas.2017.611.274.
10. Verma, Amar Kant, Yadav PN. Productivity and water-use efficiency of linseed (*Linum usitatissimum* L.) based cropping systems as influenced by integrated nutrient management under rainfed condition. Journal of Soil and Water Conservation 2018;17(1):53-57.