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RESPONSE OF CHICKPEA AND ITS WEEDS TO TILLAGE SYSTEMS USING VARYING SEED RATES AND PHOSPHORUS LEVELS

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ABSTRACT

The experiment on the response of chickpea and its weeds to tillage systems (Conventional and zero) using varying seed rates (40, 80, 120 kg ha^{-1}) and phosphorous levels (0, 80,120 Kg ha^{-1}) was investigated at Agriculture Research Farm, Khyber Pakhtunkhwa Agricultural University Peshawar, Pakistan during rabi season 2002-2003. Randomized Complete Block Design (RCBD) with split plot arrangement with four replications was used for the experiment. Plots seeded (S) at the rate of 80 kg ha^{-1} were at par with 120 kg ha^{-1} for plant height (73 cm) and number of nodules plant^{-1} (71). Phosphorous (P) applied at the rate of 80 Kg ha^{-1} had significantly higher number of nodules plant^{-1} (83) and dry weight of nodules plant $^{-1}$ (419 mg). Statistical analysis of the data revealed that tillage system, seed rates, phosphorous levels and the interaction between seed rate and phosphorous levels (SxP) had a significant effect on weed biomass m^{-2}. The higher weed biomass of 212 g m^{-2} as compared to conventional tillage was recorded for zero tillage system. The maximum weed biomass of 222 g m^{-2} was recorded in plots seeded @ 40 kg ha^{-1} while minimum value of 156 g m^{-2} was recorded in plots planted @ 120 kg ha^{-1}. Similarly Minimum biomass of weeds (181 g m^{-2}) was recorded in plots without P, while maximum biomass of 199 g m^{-2} was recorded in plots receiving 120 kg P ha^{-1}. It is deciphered from the data that the conventional tillage had lower weeds biomass than the zero tillage system. For the effect of seed rate it was noticed that weeds biomass decreased with increase in number of plants per unit area as seed rates of 120 kg ha^{-1} had minimum weeds biomass (156 g) as compared to the other two seed rates. Thus, conventional tillage under higher seed rates is recommended for weed suppression and increased chickpea production in the area.

Key words: Seed rates, phosphorus levels, tillage systems.

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INTRODUCTION

Chickpea (*Cicer aurietinum* L.) belongs to family Papilionaceae (Fabaceae) and ranks among the world three most important pulse crops. It is grown in Pakistan for food and many other purposes. Chickpea is grown under three cropping systems in Pakistan i.e. rainfed system which constitute 88% of the total cropped area, rice based system constitute 11% of the total cropped area and irrigated system which constitute about 1 % of the cropped area (Malik, 1991).

The total cropped area of chickpea in Pakistan during the year 2006-7 was 1052.3 thousand ha and a total production was 837.8 thousand tons with an average grain yield of 833 kg ha^{-1} while in Khyber Pakhtunkhwa during the same year total cropped area was 49 thousand hectares and total production was 21 thousand tons (MinFAL, 2007). In Khyber Pakhtunkhwa, the main chickpea growing areas are D.I.Khan, Tank, Lakki Marwat, Karak and Kohat.

Chickpea is valuable source of dietary protein (12.4-31 %), fats (3-8 %), minerals and vitamins (Williams and Singh, 1987). The green leaves and pods of chickpea are mostly used as vegetable. Chickpea seed is usually cooked either alone as a thin spiced porridge (*dhal*) or mixed with rice or other vegetables. Its flour (*baisan*) produces a very glutinous paste with good binding qualities. Hence, it is used in the preparation of fried, savory snack and *baisan* curry. In the food menu of diabetic patients, gram is considered beneficial because of its lowering effect on blood glucose level.

Chickpea is generally considered to be a hardy crop which adapts well to a wide range of soil and environmental conditions and requires few inputs. It can be grown in either wet or dry climate, and different cropping patterns can be used. It can be cultivated on soil with extremely marginal fertility that is not considered suitable for cereals. It grows well in clayey soil or sandy soil. In dry-farming systems of sandy zones gram is a source of cash income for the farmers and it also provides livestock feed.

It is not uncommon to come across chickpea fields with inadequate plant stand. This could be due to the poor seedbed preparation and lower seed rate than the recommended one and lack of mineral nutrients particularly phosphorus. Tillage practices play a significant role in conservation of moisture. Zero tillage may help in moisture conservation in rained condition as compared with conventional tillage. Phosphorus is a key element in the formation of high energy compounds, such as adenosine mono-phosphate (AMP), adenosine di-phosphate (ADP) and adenosine tri-phosphate (ATP) which play vital role in photosynthesis and respiration. Phosphorous is essential for energy transformation in plant cells, cell division, early root development, tillering, flowering and seed/fruit development.

Moreover phosphorous contributes to improve yield and quality of the crop. It also increases crop resistance to diseases. In legumes it induces rhizobial activity, nodules formation and thus nitrogen fixation. Low yield and poor quality of the crops are often observed in case of inadequate supply of phosphorous. Phosphorous deficiency is widespread in most (90 %) of the soil of Pakistan and the application of phosphatic fertilizer is considered essential for good crop production. Current average phosphorous fertilizer rate is about one third than what is actually recommended for optimal crop production (Rashid, 2001).

Keeping in view the importance of tillage practices, seed rate, weed infestation and phosphorous fertilizers, an experiment was conducted to find suitable tillage system, optimum seed rate, proper phosphorous level and weed control for obtaining higher yield as chickpea is one of the most important restorative legume pulses adapted to southern belt of our province (Khyber Pakhtunkhwa).

MATERIALS AND METHODS

The experiment entitled response of chickpea and its weeds to tillage systems using varying seed rates and phosphorous levels was conducted at Agriculture Research Farm, Khyber Pakhtunkhwa, Agricultural University, Peshawar during rabi season 2002-2003. The experiment was carried out in Randomized Complete Block Design (RCBD) with split plot arrangement having four replications. Chickpea variety HASSAN-2K was sown in two tillage systems (zero tillage and conventional tillage), with three phosphorous levels (0, 80, 120 kg ha^{-1}) and three seed rates (40, 80, 120 kg ha^{-1}). Tillage practices were assigned to sub plots. The sub plots size was kept as 9 m^2 after thorough seed bed preparation and demarcation of sub plots. A basal dose of nitrogen (20 kg ha^{-1}) was applied at the time of sowing. Chickpea seed was planted in rows 30 cm apart having 6 rows $plot^{-1}$ on 4^{th} November, 2002. The following parameters were studied during the During the course of study, the data were recorded on Plants m^{-2}, Plant height (cm), Weeds biomass (m^{-2}), Number of nodules $plant^{-1}$, Dry weight of nodules and Number of pods $plant^{-1}$.

The data regarding weed biomass m^{-2} was recorded by collecting weeds in each sub-sub-plot and let them air-dried on the research farm. The dried biomass weight was recorded and converted into weed biomass m^{-2} by the following formula:

$$\text{Weeds biomass } m^{-2} = \frac{\text{Weeds biomass (subplot) x 1m x 1m}}{\text{Total area of subplot } (m^{-2})}$$

RESULTS AND DISCUSSION

Number of plants m^{-2}

Data regarding plants m^{-2} are presented in Table-1. Statistical analysis of the data revealed that both the tillage systems had significantly affected plants m^{-2}. Mean values showed that maximum number of 27 plants m^{-2} were observed in conventional tillage system as compared to the zero tillage system (25). Seed rate had also a significant effect on plants m^{-2}. Maximum number of 40 plants m^{-2} were observed in plots that had received 120 kg seed rate ha^{-1} while minimum of 12 plants m^{-2} were observed in plots seeded@ 40kg ha^{-1}. The effect of phosphorous and all other possible interactions were not significant on number of plants m^{-2}.

Plant height (cm)

Data recorded on plant height (cm) is given in Table-2. Statistical analysis of the data revealed that plant height (cm) was not significantly affected by both the tillage systems, phosphorous levels and all the possible interactions but was significantly affected by various seed rates. Mean values of the data showed that minimum plant height of 64 cm was recorded in plots seeded @ 40 kg ha^{-1} while the plant height of other seed rates was significantly lower than 40 kg ha^{-1} and were at par with each other.

Table-1. Number of plants m^{-2} of chickpea as affected by tillage systems, seed rates and phosphorous levels.

Tillage (T)	Seed rate (S) (kg ha^{-1})	Phosphorous (P) (kg ha^{-1})			Mean
		0	80	120	
		T x	S x	P	T x S
Conven	40	12	12	13	12
	80	27	27	27	27
	120	41	41	41	41
	40	12	10	11	11
Zero	80	25	24	24	24
	120	39	40	40	40
		T	**x**	**P**	**T**
Conven		27	27	27	27a
Zero		25	25	25	25b
		S	**x**	**P**	**S**
	40	12	11	12	12e
	80	26	26	25	26b
	120	40	40	41	40a
Mean (P)		26	26	26	

LSD value at 5 % for S = 10
Value followed by different letter are significantly different at 5 % level of probability, using Least Significant Difference (LSD) test.

Plant height (cm) was significantly affected by various seed rates (Table 4). Plant height increases with the increase in seed rate up to 80 kg ha^{-1} but no significant increase in plant height was noticed as seed rate was further increased. The data indicated that minimum plant height was recorded in plots planted at 40 kg ha^{-1} seed rate, while maximum plant height was found in plots seeded at 80 or 120 kg h^{-1}. The more plant height at higher seed rate could be due to the greater competition between plants at high seed rate for light and as result tallest plants were observed. Increase in plant height with increase in number of plant m^{-2} for various crops have been reported by Selim and El-Seesy (1991) who stated that increasing plant population have increased plant height.

Weeds biomass m^{-2} (g)

Data regarding weeds biomass m^{-2} are presented in Table-3. Statistical analysis of the data revealed that tillage system, seed rates, phosphorous levels and the interaction between seed rate and phosphorous levels (SxP) had a significant effect on weed biomass m^{-2}. Mean values of the data sowed that maximum weed biomass of 212 g m^{-2} was recorded for zero tillage systems while minimum weeds biomass of 172 g m^{-2} was recorded for conventional tillage systems. The data regarding seed rate showed that maximum weed biomass of 222 g m^{-2} was recorded in plots seeded @ 40 kg ha^{-1} while minimum value of 156 g m^{-2} was recorded in plots planted @ 120 kg ha^{-1}. Similarly phosphorous had also a significant effect on weeds biomass. Minimum biomass of weeds (181 g m^{-2}) was recorded in plots without P, while maximum biomass of 199 g m^{-2} was recorded in plots applied 120 kg P ha^{-1} although it was at par with 80 kg P ha^{-1}. In case of the interaction between S x P minimum weeds biomass of 139 g m^{-2} was recorded in plots seeded @ 120 kg ha^{-1} while higher weeds biomass was recorded in plots planted with lowest seed rate of 40 kg ha^{-1}, applied either 80 or 120 kg P ha^{-1}. Weeds biomass was significantly affected by both the tillage systems, seed rates, phosphorous levels and interaction between seed rate and phosphorous levels (S x P). It can be seen from the data (Table-3) that the conventional tillage had lower weeds biomass than the zero tillage system. This might be due to the fact that weeds were not left for germination or were destroyed after germination due to repeated ploughing. Comparing the effect of seed rate it was noticed that weeds biomass decreased with increase in number of plants per unit area as seed rates of 120 kg ha^{-1} had minimum weeds biomass (156 g) as compared to the other two seed rates. The probable reason for this is that at high seed rates there were more plants of chickpea per unit area which have suppressed the weeds. These results are in conformity with Vaishya *et al*., (1995) who reported that weed biomass and nodulation decreases with increase in seed rates. Phosphorous application had significantly higher weeds biomass as compared with control plots which had the lowest weeds biomass m^{-2} (181 g). Weeds biomass increases with the increase in phosphorous levels but the differences among phosphorous levels were not significant indicating that phosphorous doses have not promoted the growth of weed species. These results are in conformity with those reported by Mishra *et al*., (1995) who observed that increase in weeds biomass with phosphorous application as compared with control. Higher weeds biomass m^{-2} at the lowest seed rate (40 kg ha^{-1}) with phosphorous levels (80 and 120 kg ha^{-1}) reveals that at lower seed rate phosphorous application has favored weed infestation but when seed rate has increased the gram plants has taken the advantage of phosphorous as a result less weeds biomass was recorded.

Number of nodules plant^{-1}

Data regarding number nodules plant^{-1} are presented in Table-4. Statistical analysis of the data indicated that both the tillage systems, seed rates, phosphorous levels and interaction between seed rate and phosphorous, (S x P), tillage systems and phosphorous (T x P) and tillage systems, seed rate and phosphorous (T x S x P) had significant effect on number of nodules plant^{-1}. More number of 73 nodules plant^{-1} were recorded in plot of zero tillage system while 70 nodules plant^{-1} were recorded in plots of conventional tillage systems. The data for seed rates showed that maximum number of 74 nodules plant^{-1} were recorded in plots seeded @ 40 kg ha^{-1} while minimum number of 70 and 71 nodules plant^{-1} were recorded for plots planted @ 80 and 120 kg ha^{-1} respectively.

In case of phosphorous maximum number of 83 nodules plant^{-1} were recorded in plots applied with 80 kg P ha^{-1} while minimum number of 62 nodules plant^{-1} were counted in phosphorous control plots. The data showed that in case of interaction between S x P maximum nodules plant^{-1} were recorded in plots seeded at 40 or 120 kg ha^{-1}, applied with 80 kg P ha^{-1}, while the number of nodules plant^{-1} were lower in plots planted without phosphorous. Data regarding the interaction between tillage systems and phosphorous levels also showed that maximum number of 86 nodules plant^{-1} were counted in plots of conventional tillage system applied with 80 kg P ha^{-1} while minimum number of 55 nodules plant^{-1} were counted for conventional tillage system applied with no phosphorous. Similarly, in case of the interaction between T x S x P showed that generally P application had increased nodulation. Our results are in close proximity with Sidras *et al*.(1999) who reported that nodulation was highest in no tillage system as compared with other tillage systems. The number of nodules plant^{-1} decreased with increase in seed rate, as highest number of nodules plant^{-1} were recorded in plots planted @ 40 kg ha^{-1}, while the number of nodules plant^{-1} were significantly lower in plots planted at 80 or 120 kg ha^{-1}. These results are in agreement with those of Vaishya *et al*.(1995) who reported that nodulation decreases with increase in seed rates which might be due to the competition between the roots for phosphorous for nodulation. Phosphorous application had increased nodulation as compared with control. Highest number of nodules were recorded at 80 kg P ha^{-1} but decreased with the increase in P level up to 120 kg ha^{-1}. These results are in line with Ravankar *et al*. (1997) who concluded that growth and nodulation were greatest with 80 kg P ha^{-1}.

The interaction between S x P showed that plots receiving 120 kg P ha^{-1}and seed rate 80 kg P ha^{-1} gave maximum number of nodules plant^{-1}, while the plots sown with either seed rate but without phosphorous plays an important role in nodulation of plants. The interaction between T x P revealed that plots of conventional tillage system, applied with 80 kg P ha^{-1} had significantly more nodules plant^{-1} followed by 120 kg P ha^{-1}. Plots without phosphorous had the lowest nodules plant^{-1}. Mean values of the interaction between T x S x P indicated that number of nodules plant^{-1} were generally lower in plots without phosphorous. Conventional tillage system had lower values of nodules plant^{-1} as compared with zero tillage system at either seed rates.

Table-2. Plant height (cm) of chickpea as affected by tillage systems, seed rates and phosphorous levels.

Tillage (T)	Seed rate (S) (kg ha^{-1})	Phosphorous (P) (kg ha^{-1})			Mean
		0	80	120	
		T	**x S**	**x P**	**T x S**
Conven	40	63	66	64	65
	80	68	73	74	72
	120	74	71	73	72
	40	61	68	62	64
Zero	80	70	77	77	75
	120	72	74	72	73
		T	**x**	**P**	**T**
Conven		69	70	70	70
Zero		68	73	70	70
		S	**x**	**P**	**S**
	40	62	67	63	64b
	80	69	75	75	73b
	120	73	73	72	73a
	Mean (P)	68	72	70	

LSD value at 5 % for S = 3

Value followed by different letter (s) are significantly different at 5 % level of probability, using (LSD) test.

Table-3. Weeds biomass (g) m^{-2} of chickpea as affected by tillage systems, seed rates and phosphorous levels.

Tillage (T)	Seed rate (S)(kg ha^{-1})	Phosphorous (P) (kg ha^{-1})			Mean
		0	80	120	
		T x	S x	P	T x S
Conven	40	167	210	225	201
	80	162	185	192	180
	120	155	134	117	135
	40	212	252	262	242
Zero	80	195	220	237	217
	120	195	177	160	177
		T	**x**	**P**	**T**
Conven		162	176	178	172
Zero		201	217	220	212
		S	**x**	**P**	**S**
	40	190cd	231a	244a	222a
	80	179de	202bc	215b	199b
	120	175e	156f	139g	156c
Mean (P)		**181b**	**196a**	**199a**	

LSD value at 5 % for S = 9, LSD value at 5 % for P = 9
LSD value at 5 % for SxP = 15
Value followed by different letter (s) are significantly different at 5 % level of probability, using least test.

Table-4. Number of nodules $plant^{-1}$ of chickpea as affected by tillage systems, seed rates and phosphorous levels.

Tillage (T)	Seed rate (S)(kg ha^{-1})	Phosphorous (P) (kg ha^{-1})			Mean
		0	80	120	
		T x	S x	P	T x S
Conven	40	59ijk	87a	77c-f	74
	80	55jk	84a-c	64hi	68
	120	52k	86a	70fg	69
	40	66g-i	80a-d	77b-f	74
Zero	80	65g-i	74d-f	79a-e	73
	120	72e-g	85ab	60ij	73
		T	**x**	**P**	**T**
Conven		55d	86a	70c	70b
Zero		68c	80b	72c	73a
		S	**x**	**P**	**S**
	40	62e	84ab	77cd	74a
	80	60e	79bc	71d	70b
	120	62e	86a	65e	71b
Mean (P)		**61c**	**83a**	**71b**	

LSD value at 5 % for S = 3.3, LSD value at 5 % for P = 3.3
LSD value at 5 % for T x P = 4.6, LSD value at 5 % for S x P = 5.7
LSD value at 5 % for T x S x P = 8.0
Value followed by different letter (s) are significantly different at 5 % level of probability, using LSD test.

Dry weight of nodules plant^{-1}(mg)

Data on dry weight (mg) of nodules are given in Table-5. Statistical analysis of the data revealed that both the tillage systems, phosphorous and all the interactions had significantly affected the dry weight of nodules, while seed rate had no significant effect on dry weight of nodules. Mean values of the tillage systems showed that higher dry weight of 388.42 mg was recorded in zero tillage system while 361 mg dry weight was recorded in conventional tillage system. Similarly for phosphorous maximum dry weight of 419 mg was recorded in plots applied with 80 kg P ha^{-1} while minimum dry weight of 316 mg was recorded in control plots. Data regarding the interaction between T x P showed that maximum dry weight were recorded in plots applied with 80 kg P ha^{-1} irrespective of tillage systems, however, plots with P had significantly more dry weight of nodules as compared with no phosphorous application. Similarly for the interaction between S x P maximum dry weight of 442 mg was recorded in plots seeded @ 120 kg ha^{-1}, applied with 80 kg P ha^{-1} while minimum dry weight of 313 mg was recorded for plots seeded at either seed rate with no phosphorous. The data regarding interaction between T x S x P showed maximum dry weight of 443 mg for zero tillage system seeded @ 120 kg ha^{-1}, applied with 80 kg P ha^{-1} and minimum dry weight of 267 mg in plots of conventional tillage system seeded @ 120 kg ha^{-1} and where no phosphorous was applied. The interaction between T x S showed maximum dry weight in plots of zero tillage system seeded @ 120 kg ha^{-1} and minimum dry weight of 355 mg in plots of conventional tillage system at either 80 or 120 kg ha^{-1} seed rate. Weeds biomass was significantly affected by both the tillage systems, seed rates, phosphorous levels and interaction between seed rate and phosphorous levels (S x P). It can be seen from Table-5 that conventional tillage had minimum weeds biomass than the zero tillage system. This might be due to the fact that weeds were not left for germination or were destroyed after germination due to repeated ploughing. Comparing the effect of seed rate it was noticed that weeds biomass decreased with increase in number of chickpea plants per unit area as seed rates of 120 kg ha^{-1} had minimum weeds biomass (156 g) than the other two seed rates. The probable reason for this is that at high seed rates there were more plants of chickpea per unit area which have suppressed the growth weeds. Vaishya *et al*., (1995) stated that weed biomass and nodulation decreases with increase in seed rates. Phosphorous application had significantly higher weeds biomass as compared with control plots which had the lowest weeds biomass m^{-2} (181 g). Weeds biomass increase with the increase in phosphorous levels but the difference among phosphorous levels was not significant indicating that phosphorous doses have promoted the growth of weed species. These results are in conformity with those reported by Mishra *et al*., (1995) that increase in weeds biomass occur with phosphorous application as compared with control. Higher weeds biomass m^{-2} at the lowest seed rate (40 kg ha^{-1}) with phosphorous levels (80 and 120 $kgha^{-1}$) reveals that at lower seed rate phosphorous application has favored weed infestation but when seed rate has increased the chickpea plants has taken the advantage of phosphorous as a result less weeds biomass was recorded.

Table-5. Dry weight (mg) of nodules of chickpea as affected by tillage systems, seed rates and phosphorous levels.

Tillage (T)	Seed rate (S) (kg ha^{-1})	Phosphorous (P) (kg ha^{-1})			Mean
		0	80	120	
		T	x S	x P	T x S
Conven	40	298f	389cd	443a	377b
	80	288f	430ab	346e	355c
	120	267f	440a	356de	354c
	40	355e	422a-c	390cd	383b
Zero	80	338e	387cd	403bc	376b
	120	367de	443a	409a-c	406a
		T	**x**	**P**	**T**
Conven		284d	420a	382b	362b
Zero		374c	418a	401b	379a
		S	**x**	**P**	**S**
	40	317e	406bc	416b	380
	80	313e	409b	374e	365
	120	317e	442a	383cd	380
Mean (P)		**316c**	**419a**	**391b**	

LSD value at 5 % for P = 14, LSD value at 5 % for T x P = 20
LSD value at 5 % for S x P = 25, LSD value at 5 % for T x S x P = 35
LSD value at 5 % T x S = 20, Value followed by different letter (s) are significantly different at 5 % level of probability, using LSD test.

Number of pods plant^{-1}

Data on pods $plant^{-1}$ are given in Table-6. Statistical analysis of the data showed that seed rate and phosphorous levels had a significant affect on pods $plant^{-1}$, while the tillage systems and all possible interactions had no significant effect on number of pods $plant^{-1}$. Mean values of seed rates showed that maximum (79) pods $plant^{-1}$ were recorded in plots seeded @ 40 kg ha^{-1} while minimum number of 68 pods $plant^{-1}$ were recorded in plots seeded @ 120 kg ha^{-1}. Similarly for phosphorous levels maximum number of 77 pods $plant^{-1}$ were recorded in plots applied with 80 kg P ha^{-1} while minimum number of 71 pods $plant^{-1}$ were calculated in control plots. Number of pods $plant^{-1}$ was significantly affected by various seed rates and different phosphorous levels. It can be seen from the data (Table-6) that number of pods plant^{-1} significantly decreased when seed rate was increased. As minimum number of (68) pods plant^{-1} were recorded in plots planted @ 120 kg ha^{-1}. The reason for this might be that at lower seed rate the plants had adequate space, food and other inputs for optimum growth that resulted in more branches plant^{-1} which ultimately showed up in more pods plants^{-1}. Phosphorous also showed the same trend as was noticed for seed rates as plots with out phosphorous had significantly lower pods plant^{-1} and number of pods plant^{-1} increased when phosphorous was increased to 80 kg P ha^{-1}. These results are confirmed by Shabir (1982) and Khan *et al.,* (1997) who stated that application of phosphate ha^{-1} significantly increased number of pods plant^{-1} in *Cicer arientum.*

Table-6. Number of pods plant^{-1} of chickpea as affected by tillage systems, seed rates and phosphorous levels.

Tillage (T)	Seed rate (S)(kg ha^{-1})	Phosphorous (P) (kg ha^{-1}) 0	80	120	Mean
		T x	**S x**	**P**	**T x S**
Conven	40	70	81	78	76
	80	72	74	73	73
	120	65	69	67	67
	40	75	86	83	82
Zero	80	77	81	80	80
	120	67	70	68	68
		T	**x**	**P**	**T**
Conven		69	75	72	72
Zero		73	79	77	77
		S	**x**	**P**	**S**
	40	73	84	80	79a
	80	75	78	76	76a
	120	66	70	67	68b
Mean (P)		**71b**	**77a**	**74a**	

LSD value at 5 % for S = 2.9, LSD value at 5 % for P = 2.9
Value followed by different letter (s) are significantly different at 5 % level of probability, using LSD test.

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