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Forage Potential of Intercropping Barley with Alfalfa under Agrohumic Fertilizer

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ABSTRACT

This experiment was conducted to evaluation of forage potential of intercropping barley with alfalfa under agrohumic fertilizer .The experimental treatments were intercropped barley/alfalfa with 25/75; 50/50, 75/25 ratios along with their sole crops as control plots. Treatments were arranged in a split plot design based on a RCBD with 3 replications. Main factor included agrohumic at four levels (0, 5, 7 and 10 lit/1000lit water per ha). According to result, we suggest using of 7 liter/1000 liter water per ha for intercropping of barley and alfalfa, also using of 50/50 ratio for barley and alfalfa is better ratio for intercropping.

Introduction

Intercropping is one of the common methods of multiple cropping which encourage sustainability in agriculture through increasing plant diversity (biodiversity) in agroeco systems, soil erosion control, soil fertility maintenance and more efficient use of resources. Intercropping can provide numerous benefits to cropping systems through increasing total yield and land use efficiency, improving yield stability, enhancing light, water, and nutrient use, and controlling weeds, insects, or diseases (Willey, 1979).Intercropping has since long been used as mean to cover the risk of failure of base crop and maintain the net return. Juskiw et al. (2000) reported that various mixtures of barley, oat, triticale, and rye (Secale cereale L.) displayed extended harvest periods and had better forage nutritive value, as measured by NDF and acid detergent fiber (ADF), compared with sole crops. The inclusion of legumes in forage intercrops can provide a more sustainable source of N to cropping systems through biological N fixation (Crews and Peoples, 2004).Alfalfa (*Medicago sativa* L.) is one of the most important forage crops grown over a wide range of sod and climatic conditions and it is able to produce high yields without nitrogen fertilization. Abdel Magid et al. (1991) reported that intercropping had benefits for alfalfa, increasing its protein content, green chop and hay yield. Available reviews of literature show that, in many experiments conducted at different countries the performance of mixing cropping systems was better than the sole crops. For instance mixing cropping of berseem clover/ lolium (Vaezzadeh, 1994), alfalfa/timouthy (Zaeifizadeh et al., 1994), barley/pea (Mandhal et al., 1994). Mixed cropping of legumes and grasses for forage production is not a common practice among Iranian farmers, however, it is necessary to investigate the potential forage production (mixed and sole cropping) to introduce as alternative forage production system among farmers. The main objective of this research was to compare sole and intercropping of alfalfa and barley for potential forage production under Agrohumic fertilizer.

Material and method

The experimental site is located in Parsiantown, Hormozgan province. Average annual rainfall in this area is 144 mm. Each experimental plot consisted of four rows of four m length and 50 cm apart. The experimental treatments were intercropped barley/alfalfa with 25/75; 50/50, 75/25 ratios along with their sole crops as control plots. Treatments were arranged in a split plot design based on a RCBD with 3 replications. Main factor included agrohumic at four levels (0, 5, 7 and 10 lit/1000lit water per ha). The end of experiment, we evaluated some traits such as plant height, biological yield, seed yield and Spike numbers per m^2 for barley and plant height, dry yield, leaf numbers and leaf dry weight for alfalfa.

Result and discussion

According to Anova(table 1) for barley, it was observed that agrohumic had significant effect on spike numbers at 1% statistical level and on biological yield and seed yield at 5% statistical level. Our result didn't show significant effect for intercropping and its introduction with agrohumic.

Spike numbers: Application of 5, 7 and 10 liter of agrohumic decreased spike numbers 11, 5 and 9% in compare to control, respectively. According to interaction, highest means (32.67 per m^2) was obtained by 25%barley/75%alfalfa and 0 liter agrohumic while the 50%barley/50%alfalfa and 10 liter agrohumic showed lowest means (24.67).

Biological yield: Highest(50.63 gr/plant) and lowest (35.53 gr/plant) biological yield was observed by 0 liter agrohumic + 25/75 treatment and 10 liter agrohumic + 100/0, respectively. Biological yield reduced by 5 and 10 liter agrohumic fertilizer in compare to control, also 7 10 liter agrohumic didn't show significant different with control.

Seed Yield: Agrohumic levels didn't show significant different in compare to control except of 5 liter. 5 liter treatment reduced seed yield by 37%. Application of 50/50 with 5 liter of agrohumic increased seed yield 26% in compare to 100% barley and without fertilizer.

According to Anova table (3), it was founded that all trait of alfalfa were affected by treatments except of Leaf number.

Height plant of alfalfa: this trait was affected by agrohumic fertilizer, so that, application of 7 lit of agrohumic increased height plant about 4% in compare to control.

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Table 1: Analysis of variation for barley treats (mean of squares)					
Source of variations	**df**	**Plant height**	**Spike numbers**	**biological yield**	**seed yield**
block	2	36.376	16.75	9.557	5069.055
Agrohumic	3	59.947	24.41**	107.247*	60766.14*
Error A	6	29.4	2.472	15.175	9094.43
Intercropping	3	6.497	14.896	30.305	8504.255
interaction	9	19.33	11.039	50.106	17492.11
Error B	24	18.558	9.208	34.574	16634.61
C.V%		5.07	10.86	13.16	29.3
*and** show significant effects at 5 and 1 %, respectively					

Table 2: Comparison of barley traits means									
Agrohumic (lit/1000lit water per ha)	**Barley/alfalfa**	**Plant height(cm)**		**Spike numbers per m^2**		**biological yield (gr/plant)**		**seed yield (kg/ha)**	
0	25/75	89.53	a	32.67	a	50.63	a	569.2	a
	50/50	85.03	ab	28.67	ab	40.5	abc	351.4	abc
	75/25	83.83	ab	30	ab	48.93	ab	527.4	ab
	100/0	84.8	ab	27.67	ab	48.43	ab	415.7	abc
5	25/75	86.87	ab	25.67	b	38.53	bc	241.9	c
	50/50	89.6	a	28	ab	41.93	abc	377.7	abc
	75/25	89.2	a	25.33	b	43.77	abc	265.2	c
	100/0	85.67	ab	27	ab	43.1	abc	298.8	bc
7	25/75	81.53	ab	28.67	ab	50.1	ab	451.7	abc
	50/50	82.93	ab	30.33	ab	50	ab	457.9	abc
	75/25	83.1	ab	26.33	b	44.03	abc	305.7	bc
	100/0	87	ab	28	ab	45.37	abc	439	abc
10	25/75	81.53	ab	28.33	ab	46.97	abc	443.6	abc
	50/50	84.27	ab	24.67	b	42.1	abc	374.1	abc
	75/25	80.2	b	29	ab	44.77	abc	355.4	abc
	100/0	85.53	ab	26.67	b	35.53	c	371.1	abc
Means with similar alphabet don't show significant different (Duncan 5%)									

Table 3: Analysis of variation for alfalfa treats (mean of squares)					
Source of variations	**df**	**Height plant**	**Leaf number**	**Leaf dry weight**	**Dry yield**
block	2	6.238	2219.398	1.021	1573671.2
Agrohumic	3	393.828*	8893.652	13.389*	4541644.4
Error A	6	71.968	2600.902	2.41	9134108.5
Intercropping	3	42.649	1284.985	3.167	6607488.2
interaction	9	48.192	1084.67	9.037**	8298471.2*
Error B	24	31.564	694.343	1.424	3590631.9
C.V%		8.73	19.96	27	20.5
*and** show significant effects at 5 and 1 %, respectively					

Table 4: Comparison of alfalfa traits means									
Agrohumic (lit/1000lit water per ha)	**Barley/alfalfa**	**Height plant**		**Leaf number**		**Leaf dry weight (gr/plant)**		**Dry yield**	
0	0/100	64.37	a-d	126.1	bc	2.667	e	1202	c
	25/75	62.1	a-e	118.8	c	2.333	e	879.3	c
	50/50	65.63	abc	130.7	bc	3.667	cde	2524	bc
	75/25	72.13	a	136	bc	7	ab	6311	a
5	0/100	57.33	cde	172.3	b	4	cde	2912	abc
	25/70	60.77	b-e	139.6	bc	2.667	e	2105	bc
	50/50	51.87	e	152.8	bc	3.333	de	2249	bc
	75/25	53.83	de	222	a	5.333	bcd	3288	abc
7	0/100	71.77	ab	110	c	8	a	4522	abc
	25/75	72.8	a	129	bc	5.667	bc	3288	abc
	50/50	65.7	abc	102.7	c	7	ab	2762	abc
	75/25	65.1	abc	115.7	c	3.333	de	1386	c
10	0/100	71.2	ab	120.6	c	4.333	cde	2319	bc
	25/75	64	a-d	107.5	c	4	cde	1703	c
	50/50	63.63	a-d	115.8	c	4	cde	1602	c
	75/25	67.33	abc	112.3	c	3.333	de	1570	c
Means with similar alphabet don't show significant different (Duncan 5%)									

Highest means was observed by 25/75 barley/alfalfa with 7liter agrohumic fertilizer.

Leaf number: this trait was not affected by treatments. It seems, this trait is under control of genetically factors.

Leaf dry weight: Agrohumic factor showed significant effects on leaf dry weight, so that, 7 liter had highest means in compare to other treatments. According to interaction between fertilizer and intercropping, 7 liter fertilizer with 0/100 barley/alfalfa showed highest means.

Dry yield: Analysis of variance showed significant effects for interaction between experiment factors at 5%. Lowest means was observed by 25/75 barley/alfalfa without fertilizer and highest means induced by 75/25 barley/alfalfa without fertilizer. Some researcher mentioned that high levels of fertilizer didn't increase plant traits equal to low level of fertilizer. One reason for this phenomenon is salinity of soil after using of high level offertilizer (Vaseghi, 2005).According to result, we suggest using of 7 liter/1000 lit water per ha for intercropping of barley and alfalfa, also using of 50/50 ratio for barley and alfalfa is better ratio for intercropping.

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