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RESPONSE OF SOME FEED MIXTURES TO NPK FERTILIZER AND ITS EFFECT ON FIBER TYPES

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Abstract

Field experiment was conductive during the growing season (2016-2017) at the second Agriculture research station affiliated to the Agriculture college- Al-Muthanna University in which it located on the Euphrates river in Al-Bandar village, southwest of Al-Muthanna Province, about 800 m away from Al-Samawah city center. In order to comprehend, the effect fertilizer level of NPK (60, 100 and 140 kg/ ha^{-1}) in growth and yield alfalfa (with seeds rate 40 kg/ ha^{-1}) with oat, barley and triticale (with seeds rate 160 kg/ ha^{-1}) through four time cutting. The treatments arranged using RCBD with three replicates. The results showed that the a significant effect of the forage mixtures treatment of (alfalfa + triticale) on quality Cellulose 51.62% and Hemocellulose 39.16% in the first cutting and Pectin 1.72 % at the second cutting, The Lignin recorded (alfalfa + barley) the highest 25.64 % at the third cutting. Fertilizer treatments also showed the significant at the treatment 140 kg / ha^{-1} NPK. The interaction between the experiment factors (forage mixtures and NPK fertilizer) conducted the same behavior as the individual factors. Thus, the interaction treatment of (alfalfa + triticale) with 140 kg / ha^{-1} NPK recorded the highest levels of Cellulose 54.71% and the Lignin 28.31% through fourth cutting, and the treatment (alfalfa + triticale) with 140 kg NPK ha^{-1} gave the highest level in Hemocellulose and Pectin 42.26%, 2.90% respectively.

Key words : feed mixtures, NPK fertilizer, fiber types.

Introduction

There were several types of fiber, the most important Acid Detergent Fibber (ADF) and Neutral Detergent Fibber (NDF). The raw fiber is thought to represent the cell wall, Recent studies have shown that hemocellulose and lignin are taken into account in the estimation of crude fiber (Schroeder, 1994). That hemicellulose and lignin are very easy to digest for farm animals, affect the quality of digested feed, lignin constitutes 0-20, cellulose 50-90% and hemicellulose 20-80% of the digested substance (Linn and Martin, 1999). Iraq suffers from the unavailability of all kinds of fodder, especially green fodder, green fodder is the cheapest feedstuff compared to concentrated feed, the importance of forage crops as fresh green feeds or preserved in the form of threshing or silage is an important source of animal feed. *Alfalfa* (*Medicago sativa* L.), Leguminasae family, Perennials, the most important forage crop in the world, high nutritional value, rich in protein and nutrients beneficial for the growth and productivity of the animal (USDA, 2007). Oats (*Avana sativa*), Poaceae family, annual herbaceous plants, grown in many countries of the world, as a dual-purpose grain and forage crop (Achleitner *et al.*, 2008). 74% of global production is used in animal feeding, Its leaves contain high nutritional value, an important and palatable forage crop (Lin *et al.*, 2010). Barley (*Hordeum vulgare* L.), Poaceae family, high nutritional value, it is used as animal feed either in the use of cereals for direct feeding or in the feed industry for the preparation of rations or for the production of green fodder (Al-Jabouri *et al.*, 2003).

The triticale (Triticosecale), Poaceae family, dual-purpose crop grain and animal feed, the best animals farm feed, necessary amino acids contained, palatability due to the content of leaves and stems of fiber compared to grains (Mayer, 1998). Phosphate fertilizer is a key nutrient that regulates plant growth, affects most plant processes, participates in the decomposition of carbohydrates and

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substances resulting from photosynthesis of the energy released by the plant in its biological processes (Abu Dahi and Younis 1988). Involved in the formation and division of living cells, transfer of genetic traits, phosphorus is a component of DNA, RNA, includes in phospholipids and enzyme compounds NAD, NADP and ATP, ADP energy compounds(Al-Naimi, 1999). It is involved with proteins in the formation of cellular membranes, like the plasma membrane and the gap membrane, potassium is also a positive nutrient dissolved in plant cell juices needed by plants, lack leads to a decrease in the photosynthesis rate per unit of paper area, which affects the final output (IPI, 2000). Activates more than 60 to 80 enzymes necessary for physiological processes (IPI, 2002). Raises plant efficiency in carbonization, through ATP composite configuration, which is the main carrier of energy in the plant, energy reservoir to represent CO2 in transporting sugar from leaves to other plant parts, the formation of starch and protein in the plant, through its importance in increasing the absorption of nitrogen by the plant (Havlin *et al.,* 2005).

This study was conducted to investigate the effect of levels of N.P.K fertilizer on growth and yield of *alfalfa*, oats, barley and triticale.

Materials and Methods

The experiment consists of two factors, the first factor is the use of different crops, alfalfa (with seeds rate 40 kg/ ha^{-1}) with oat, barley and triticale (with seeds rate 160 kg/ ha^{-1}) through four time cutting. The second factor was NPK fertilizer. Three levels of neutral NPK fertilizer (60, 100 and 140) kg/ ha^{-1} were selected. In this experiment, split plot design was used using Randomized Complete Block Design (RCBD). The land of the experiment was plowed, softened and leveled, divided according to the design used into plots with an area of ($2m \times 2m = 4m^2$), planted on 19/10/2016, the irrigation germination was given, plants were manually clipped 9-6 cm above the soil surface (Collins and J.Fritz, 2003).

Traits study

Holocellulose measurement (%)

Weigh 3 g of ground sample in a beaker, add 160 ml of distilled water and 0.5 ml of Glacial acetic acid, and 1.5 g of sodium chloride sequentially, heat the mixture to 75°C for an hour, add an extra 0.5 ml of Glacial acetic acid, and 1.5 g of sodium chloride, process is repeated twice in an hour, place the beaker in a cooling ice bath to a temperature below 1°C, Holocellulose was filtered to be washed in acetone, ethanol and distilled water, respectively. The sample is then dried in a 105°C oven and the model is weighed (W / W%).

Holocellulose measurement (%) =

$$\frac{\text{Weight after drying (W)}}{\text{Sample weight (3 g W)}} \times 100$$

Cellulose measurement (%)

Take 2 g of the holocellulose mixture, apply in baker and add 10 ml of sodium hydroxide solution (17.5%), stir every five minutes for half an hour at 20°C, add 33 ml of distilled water and leave for an hour and filter the solution to the residues of holocellulose, transfer to a powder to be washed with 100 ml of sodium hydroxide solution (8.3%), 200 ml of distilled water and 10 ml of acetic acid, the sample is then dried in the oven at 105°C.

Cellulose measurement (%) =

$$\frac{\text{Weight after drying (W)}}{\text{Sample weight (2 g W)}} \times 100$$

Lignin measurement (%)

Weigh 2 g of the sample in beaker, add 10 ml of sulfuric acid at a concentration of 72%, mix the mixture for two and a half hours at 25°C and add 20 ml of distilled water, boil for 2 hours then cool, leave 24 hours, transfer the lignin to the powder to wash it with hot water over and over until it becomes acid free. Dry the sample at 1005°C and allow to cool at room temperature.

Cellulose measurement (%) =

$$\frac{\text{Weight after drying (W)}}{\text{Sample weight (2 g W)}} \times 100$$

Pectin measurement (%)

Weigh 5 g of the sample, put in a beaker, add 85% ethanol and stir for 20 minutes at 70°C and filter the solution, add 400 ml of Oxalic acid, Ammonium oxalate 25% at 85°C for 1 hour and then filter the solution, add three volumes of 96% ethanol with the filter, place the solution in a 14500 centrifuge for 10 minutes, take the precipitate and wash it with 70-90% ethano, put in the oven at 50°C for 24 hours, take the precipitate and add 5% distilled water for five minutes under room temperature and repeat this method twice, the sterilizer is then sterilized at 121°C for five minutes, then dried, cooled and weighed.

Results and Discussion

Cellulose (%)

(Table 1) showed that the treatment (alfalfa+triticale) gave the highest mean traits during the four mites were 51.62 51.14, 50.81 and 51.26%, respectively, while alfalfa treatment recorded the lowest mean attributes were 33.33,

Table 1: Effect of feed mixture and NPK fertilizer and their interaction on cellulose(%).

Feed mixture	60 kg/ ha^{-1}	100 kg/ ha^{-1}	140 kg/ ha^{-1}	Feed mixture mean
First Clipping				
Alfalfa	30.98	35.28	33.75	33.33
Oat	41.53	45.65	43.42	43.53
Alfalfa+oat	46.74	52.15	48.84	49.24
Barley	37.97	43.11	39.52	40.20
Alfaalfa+ barley	42.77	48.46	47.04	46.09
triticale	44.84	52.69	47.55	48.63
Alfalfa+ triticale	49.24	54.72	50.90	51.62
NPK mean	42.01	47.43	44.43	
L.S.D$_{0.05}$	Feed mixture=0.14	NPK=0.13	Interaction=0.23	
Second Clipping				
Alfalfa	30.45	33.15	34.98	32.86
Oat	41.13	43.23	45.47	43.27
Alfalfa+oat	46.34	48.23	51.99	48.85
Barley	37.55	39.04	42.81	39.80
Alfaalfa+ barley	42.25	46.57	49.13	46.65
triticale	44.43	47.07	52.38	47.96
Alfalfa+ triticale	48.88	50.01	54.53	51.14
NPK mean	41.57	43.90	47.18	
L.S.D$_{0.05}$	Feed mixture=0.03	NPK=0.10	Interaction=0.20	
Third Clipping				
Alfalfa	30.25	31.40	34.89	32.18
Oat	40.91	42.84	45.36	43.04
Alfalfa+oat	46.01	47.69	51.82	48.51
Barley	37.37	38.61	42.60	39.53
Alfaalfa+ barley	41.90	46.11	47.94	45.32
triticale	44.07	46.53	48.93	46.51
Alfalfa+ triticale	48.60	49.50	54.32	50.81
NPK mean	41.30	43.24	46.55	
L.S.D$_{0.05}$	Feed mixture=1.29	NPK=1.93	Interaction=2.18	
Forth Clipping				
alfalfa	30.55	32.93	35.41	32.96
Oat	41.31	43.14	45.86	43.43
Alfalfa+oat	46.42	48.98	52.36	48.92
barley	37.80	38.72	43.13	39.88
Alfaalfa+ barley	42.42	46.40	48.63	45.81
triticale	44.47	46.83	52.84	48.04
Alfalfa+ triticale	49.15	49.94	54.71	51.26
NPK mean	41.73	43.70	47.56	
L.S.D$_{0.05}$	Feed mixture=0.59	NPK=0.77	Interaction=0.98	

32.86, 32.18 and 32.96%, respectively. The lower parts are older than the upper parts, old cell walls are usually thick with a high cellulosic content, lead to increased fiber components, lower protein content in the lower parts, leaves may be lower than the stems in the triticale, resulting in increased cellulose forgetting, which is the bulk of the fiber.

Fertilizer treatment of 100 kg/ ha^{-1} was significantly superior, with the highest mean of the recipe during the first crop was 47.43%, while the treatment of 140 kg/ ha^{-1} during the second, third and fourth gaskets gave the highest mean attributes of 47.18, 46.55 and 47.56%,

Table 2: Effect of feed mixture and NPK fertilizer and their interaction on hemicellulose(%).

Feed mixture	60 kg/ ha^{-1}	100 kg/ ha^{-1}	140 kg/ ha^{-1}	Feed mixture mean
First Clipping				
alfalfa	12.56	14.87	13.66	13.70
Oat	34.94	40.88	37.45	37.76
Alfalfa+oat	34.75	39.64	36.17	36.85
barley	27.66	31.23	28.34	29.08
Alfaalfa+ barley	30.36	34.31	31.45	32.04
triticale	32.48	38.02	35.61	35.37
Alfalfa+ triticale	36.62	42.26	38.59	39.16
NPK mean	29.91	34.46	31.61	
L.S.D$_{0.05}$	Feed mixture=1.08	NPK=1.45	Interaction=2.05	
Second Clipping				
alfalfa	11.06	11.54	13.35	11.98
Oat	33.02	33.93	39.90	35.62
Alfalfa+oat	34.34	35.45	39.24	36.34
barley	25.93	25.21	30.15	27.10
Alfaalfa+ barley	28.04	28.30	32.65	29.66
triticale	29.47	31.96	36.39	32.64
Alfalfa+ triticale	34.51	35.25	40.83	37.05
NPK mean	28.05	28.81	33.22	
L.S.D$_{0.05}$	Feed mixture=2.34	NPK=2.24	Interaction=3.89	
Third Clipping				
alfalfa	9.84	10.16	12.00	10.67
Oat	30.92	31.22	39.31	33.82
Alfalfa+oat	32.20	29.45	37.68	33.11
barley	24.14	24.41	28.55	25.70
Alfaalfa+ barley	26.33	26.25	31.11	27.90
triticale	27.62	29.61	33.07	30.10
Alfalfa+ triticale	32.97	32.35	34.54	33.29
NPK mean	26.29	26.21	30.89	
L.S.D$_{0.05}$	Feed mixture=1.07	NPK=1.23	Interaction=2.12	
Forth Clipping				
alfalfa	9.12	9.17	11.46	9.91
Oat	30.18	30.31	38.59	33.02
Alfalfa+oat	31.50	28.60	37.18	32.42
barley	23.51	23.62	28.00	25.04
Alfaalfa+ barley	25.81	25.53	30.74	27.36
triticale	27.01	28.25	33.67	29.64
Alfalfa+ triticale	32.10	31.54	38.91	34.18
NPK mean	25.60	25.28	31.22	
L.S.D$_{0.05}$	Feed mixture=0.50	NPK=0.65	Interaction=1.11	

respectively, the treatment of fertilizer 60 kg/ ha^{-1} recorded the lowest averages during the four mites were 42.01, 41.57, 41.30 and 41.73%.

The effect of the interaction between the two factors was significant, where (alfalfa+triticale x fertilizer level of 100 kg/ ha^{-1}) by giving it the highest average of the recipe reached 54.72% during the first clipped, whereas (alfalfa + triticale x fertilizer level of 140 kg/ ha^{-1}) during the second, third and fourth clipped gave mean averages of 54.53. 54.32 and 54.71%, the lowest average traits were 30.98, 30.45, 30.25 and 30.55% (single alfalfa x fertilizer at 60 kg/ ha^{-1}) during all clipping.

Table 3: Effect of feed mixture and NPK fertilizer and their interaction on lignin (%).

Feed mixture	60 kg/ ha^{-1}	100 kg/ ha^{-1}	140 kg/ ha^{-1}	Feed mixture mean
First Clipping				
alfalfa	11.11	12.58	12.88	12.19
Oat	17.65	20.25	18.03	18.64
Alfalfa+oat	18.41	22.63	20.00	20.34
barley	18.40	19.54	17.85	18.59
Alfaalfa+ barley	21.09	24.71	22.38	22.72
triticale	18.70	22.13	20.65	20.49
Alfalfa+ triticale	19.71	24.68	21.33	22.90
NPK mean	18.63	19.49	19.01	
L.S.D$_{0.05}$	Feed mixture=0.43	NPK=0.51	Interaction=0.79	
Second Clipping				
alfalfa	11.87	12.95	13.42	12.74
Oat	18.47	18.69	20.95	19.37
Alfalfa+oat	19.22	20.84	24.35	21.47
barley	18.12	17.61	20.35	18.69
Alfaalfa+ barley	22.24	22.98	26.13	23.78
triticale	19.58	21.55	23.02	21.38
Alfalfa+ triticale	20.96	21.87	25.76	22.86
NPK mean	18.63	19.49	21.99	
L.S.D$_{0.05}$	Feed mixture=0.10	NPK=0.12	Interaction=0.20	
Third Clipping				
alfalfa	12.86	13.84	14.38	13.69
Oat	19.13	19.29	22.47	20.30
Alfalfa+oat	20.20	22.16	25.66	22.67
barley	19.15	18.64	22.84	20.21
Alfaalfa+ barley	23.07	24.04	29.80	25.64
triticale	20.61	22.45	24.59	22.55
Alfalfa+ triticale	22.03	22.92	27.01	23.99
NPK mean	19.58	20.48	23.82	
L.S.D$_{0.05}$	Feed mixture=1.68	NPK=2.28	Interaction=3.20	
Forth Clipping				
alfalfa	13.87	14.80	15.92	14.86
Oat	20.69	20.65	23.43	21.59
Alfalfa+oat	24.84	22.98	27.07	24.96
barley	20.58	20.11	23.41	21.37
Alfaalfa+ barley	24.19	25.48	30.00	26.56
triticale	21.82	22.56	25.68	23.35
Alfalfa+ triticale	23.24	24.05	28.31	25.20
NPK mean	21.32	21.52	24.83	
L.S.D$_{0.05}$	Feed mixture=1.35	NPK=1.38	Interaction=2.42	

Hemicellulose

(Table 2) shows that the treatment (alfalfa+triticale), which was significantly superior, where the highest mean attributes during the first, second and fourth clipping were 39.16, 37.05 and 34.18%, respectively. During the third clipped, oat treatment was outperformed by an average of 33.82%, whereas the single alfalga treatment recorded the lowest mean traits during the four clipping were 12.56, 11.06, 9.84 and 9.12%.

Fertilizer treatment of 100 kg/ ha^{-1} was significantly superior, with the highest mean of the recipe during the first moth was 34.46, while the treatment of 140 kg/ ha^{-1}

Table 4: Effect of feed mixture and NPK fertilizer and their interaction on pectin (%).

Feed mixture	60 kg/ ha^{-1}	100 kg/ ha^{-1}	140 kg/ ha^{-1}	Feed mixture mean
First Clipping				
alfalfa	0.91	0.94	0.92	0.92
Oat	1.04	1.10	1.08	1.07
Alfalfa+oat	1.06	1.12	1.11	1.10
barley	1.03	1.07	1.04	1.04
Alfaalfa+ barley	0.99	1.07	1.05	1.03
triticale	1.14	1.22	1.16	1.17
Alfalfa+ triticale	1.12	1.21	1.17	1.16
NPK mean	1.04	1.10	1.07	
L.S.D$_{0.05}$	Feed mixture=0.004	NPK=0.004	Interaction=0.007	
Second Clipping				
alfalfa	0.87	0.89	0.88	0.88
Oat	0.98	1.02	1.00	1.00
Alfalfa+oat	1.00	1.03	1.10	1.04
barley	0.99	1.00	1.05	1.01
Alfaalfa+ barley	0.96	1.00	1.00	0.99
triticale	1.12	1.12	1.21	1.15
Alfalfa+ triticale	1.09	2.90	1.19	1.72
NPK mean	1.00	1.28	1.06	
L.S.D$_{0.05}$	Feed mixture=0.483	NPK=0.666	Interaction=1.121	
Third Clipping				
alfalfa	0.83	0.84	0.89	0.85
Oat	0.93	0.97	1.05	0.98
Alfalfa+oat	0.99	1.01	1.09	1.03
barley	0.95	0.95	1.02	0.97
Alfaalfa+ barley	0.94	0.95	1.02	0.97
triticale	1.09	1.08	0.87	1.01
Alfalfa+ triticale	1.08	1.09	1.80	1.11
NPK mean	0.97	0.98	1.01	
L.S.D$_{0.05}$	Feed mixture=0.061	NPK=0.065	Interaction=0.114	
Forth Clipping				
alfalfa	0.78	0.79	0.52	0.69
Oat	0.89	0.91	1.03	0.94
Alfalfa+oat	0.95	0.96	1.05	0.98
barley	0.90	0.90	1.00	0.93
Alfaalfa+ barley	0.86	0.88	1.06	0.93
triticale	1.04	1.03	1.18	1.08
Alfalfa+ triticale	1.04	1.05	1.15	1.08
NPK mean	0.92	0.93	1.00	
L.S.D$_{0.05}$	Feed mixture=0.123	NPK=0.131	Interaction=0.220	

during the second, third and fourth trimesters gave the highest mean attributes of 33.22, 30.89 and 31.22%, respectively, whereas, the fertilizer level of 60 kg/ ha^{-1} was the lowest in the first and second seasons at 29.91 and 28.05%, meanwhile, during the third and fourth seasons, the level of 100 kg/ ha^{-1} recorded the lowest mean of 26.21 and 25.28%.

The effect of the interaction between the two workers was significant, where (alfalfa+triticale x fertilizer level of 100 kg/ ha^{-1}) during the first and fourth seasons by giving the highest mean traits of 42.26 and 38.91%, while (alfalfa+triticale x fertilizer level of 140 kg/ ha^{-1}) during the second episode gave an average recipe of 40.83%, (Single oats x fertilizer level of 140 kg/ ha^{-1}) were

recorded average for the recipe during the third moth of 39.31%, the lowest mean traits were 12.56, 11.06, 9.84 and 9.12%, respectively were record in (Single alfalfa x fertilizer level of 140 kg/ ha^{-1}).

Lignin (%)

(Table 3) showed that the treatment of (alfalfa + triticale) was significantly higher during the first episode, giving the highest mean value of 22.90%, while the (alfalfa+ Barley) treatment recorded the highest averages during the three successive clipping of 23.78, 25.64 and 26.56%, respectively, the single alfalfa treatment gave the lowest mean traits of 12.19, 12.74, 13.69 and 14.86%, respectively.

The level of fertilizer 100 kg/ ha^{-1}, it was significantly higher as it recorded the highest mean during the first clipping of 19.49%, 140 kg/ ha^{-1} fertilizer treatment recorded during the second, third and fourth clipping with the highest mean values of 21.99, 23.82 and 24.31%, respectively, while the fertilizer level of 60 kg kg/ ha^{-1} recorded the lowest averages during the four clipping were 18.63, 19.58 and 21.32%.

The effect of the interaction between the factors was significant, where (alfalfa + barley x fertilizer level of 100 kg/ ha^{-1}) during the first clipping with an average of 24.71%, (alfalfa+ Barley x Fertilizer at 140 kg/ ha^{-1}) were recorded during the three successive clipping (second, third and fourth) with averages of 26.13, 29.80 and 30.00%, however, (single alfalfa x fertilizer level of 60 kg/ ha^{-1}) gave the lowest mean traits of 11.11, 11.87, 12.86 and 13.87%, respectively.

Pectin (%)

(Table 4) showed that the treatment of (single triticale) was significantly superior, giving the highest mean traits during the first and fourth clipping of 1.17 and 1.08%, respectively, whereas the treatment (alfalfa+ triticale) recorded the highest mean traits during the second and third clipping of 1.72 and 1.11%, the single alfalfa recorded the lowest mean traits of 0.92, 0.88, 0.85 and 0.69%.

The treatment of fertilizer 100 kg/ ha^{-1} was significantly superior, with the highest mean traits during the first and second clipping were 1.10 and 1.28%, respectively, fertilizer level 140 kg/ ha^{-1} during the third and fourth clipping had the highest mean attributes of 1.01 and 1.00%, respectively, while the fertilizer level 60 kg/ ha^{-1} recorded the lowest averages during the four clippes of 1.04, 1.00, 0.97 and 0.92, respectively.

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