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RESPONSE OF ACACIA FORAGE YIELD AND ITS QUALITY TO WATER STRESS AND CUTTING HEIGHT

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SUMMARY

Shrubs of acacia dispersed over clay or sandy regions of arid and semi-arid lands due to its tolerance to salinity. In order to re-vegetate acacia plants in the desert sand saline soils and its forage dry matter production. Two experiments accompanied during 2014, 2015 and 2016 seasons. The purposes of this investigation aimed to (1) investigate water deficit effects, i.e. irrigation at Evaporation rates 1.00, 0.67 and 0.33 ET, (2) study the effect of three stubble-heights, i.e. 20, 40 and 60 cm (3) schoolwork the interaction effects on forage dry matter yield, its quality, water use efficiency and desert re-vegetation. The tallest plant, thick stems, highest weight of green forage yield/ha, highest weight of dry forage yield/ha and the highest values of water use efficiency obtained from the first cut. While, uppermost ether extract as well as ash percentage and ash yield/ha created from the second cut. The tallest plant, thick stem, the highest green and dry matter forages yield/plant, forage, green and dry yield/ha, protein%, nitrogen free extract%, Yield/ha of protein, fiber, ether extract, ash and nitrogen free extract created for irrigation at 1.00 ET. Irrigation at 0.67 ET produced the highest water use efficiency. Irritation at 0.33 ET created the highest ether extracts, crude fiber and ash percentage. Cutting at 40 cm height produced the tallest plant, thick stems, the highest weight of green and dry foraged yield/plant, green and dry matter forage yields/ha, the highest values of water use efficiency, the highest percentages of protein and ash, yield/ha of protein, fiber and ether extract. For the moment, cutting at 60 cm height recorded the highest percentage of crude fiber and ether extract. In general, cutting at 40 cm with irrigation at 100% ET gets the great forage dry matter yield/ha, its quality and water use efficiency.

Key Words : *Acacia saligna*, Forage dry matter, Forage quality, Water use efficiency

Acacia takes a wide distribution and odd adapts to drought and salinity under clay and sandy zones. In the world, it launches a large amount of obtainable agronomic and rangelands. There is a shortage of forage products, especially out valley area in Egypt. These lands variable rainfalls and low land efficiency and low socioeconomic situation of the inhibition which shows a significant part in cattle feeding by the verdure of their high protein percentage and chemical content, soil fertility regeneration and water restoration (Otsyina *et al.*, 1996). Senna matures quickly to recover fast to coppice profusely following foliage harvest (Nduwayezu *et al.*, 2005). Human interference in the form of illegal clear-cutting and grazing of animals clearly indicated by the relatively low stocking density of trees and seedlings per unit area and the low basal area (Aref and El Atta, 2013). Forage yield of acacia was only 14% greater, under irrigation, than under dry land. Dry matter production meaningfully reduced and water use efficiency and chlorophyll content increased with the abridged sustainability of water (Nativ et al., 1999). Advanced drought tolerance employs a conservative water use strategy while later drought tolerance employs a prodigal water-use strategy (Li *et al.*, 2005). El-Khateeb *et al.* (2011) displayed that delaying the irrigation intervals needed undesirable paraphernalia of plant height, fresh and dry weights of leaves, stems and roots and total carbohydrate content in leaves and stems and the opposite trend recorded in the root. The range plants could produce many amounts of fresh biomass with irrigation between 40-60 % moisture depletion of field capacity, thus showing a net saving of 50 % of irrigation water supplies (Hussain and Al Jaloud, 2011). Delayed the irrigation interval needed undesirable properties on plant height, leaves formation, fresh and dry weights of stems and roots (Aljemaa, 2012). Water uses efficiency; especially depend on the species, soil and weather factors. Regardless of the method used water use efficiency

measured as a valuable selection criterion for larger presentations, chiefly, in a dry environment (Lazaridou *et al.* (2012). Whereas, plant types had the finest morphological growth after conserved with 50% soil moisture. The lowest growth presentation was in seedlings pickled with 12.5% soil moisture level (Andrew *et al.*, 2013). In addition, El Hadi, *et al.* (2013) opinion out that 8-day irrigation incidence found the most suitable in the outdated nursery. Therefore, the aims of this investigation were to (1) study the effect of water defects, treatments, i.e. irrigation at Evaporation rates 1.00, 0.67 and 0.33 ET, (2) study the effect of three stubble-heights, i.e. 20, 40 and 60 cm (3) and their interaction effects on forage dry matter yield, its quality, water use efficiency and desert re-vegetation.

MATERIAL AND METHODS

Agricultural practices

Seeds of Acacia chemically treated with concentrated sulfuric acid to raise the germination percentage before propagated in the greenhouse. These seeds were sown in plastic bags (8×12×25 cm) previously filled with soil and peat moss mixed in equal rate. Bags settled in the greenhouse and irrigated daily with water of 1500 micromesh/cm the selected healthy seedlings translated into the permanent site and planted in holes of 50 diameters ×50 cm depths of 3×3 m apart during 2013 season. Water applied to the establishment stage through a drip irrigation system. A valve followed by a calibrated pressure gauge fixed at each lateral inlet to control irrigation time for the nominal operating pressure of 1 bar. Emitters' type was a flat internal spiral path of a discharge of 4 L/hour under 1 bar operating pressure. Just after network installation, evaluation of irrigation uniformity and efficiently made, after the procedure of Vermerien and Joblinbg (1984). The daily atmospheric request was slow using Class A-evaporation pan that connected to the experimental site. Three irrigation treatments for daily an equal were applied water depth (d). They are as much as E0 (evapotranspiration rate) as abundant as E_0 0.67 E0 times of water application. T_a for each treatment intended found on the following empirical equation: WD = 0.3 + 0.12 q Where WD is wetting diameter in m and q is an emitter discharge in an L/hour. The rain gauge installed in the actual E_0 and calculated the net irrigation water applied. The prevailing soil in the region characterized by salty-sand soil. Soil samples taken and analyzed, the pH was 8.43, the EC was 8.5 dSm^{-1}, sand was 88.5% and organic matter was 0.62%. Experiments sites were lies at the Agriculture Experimental Station at Kalabsho and Zayan, North West Dakahlia Governorate, 31.5? North and 32.31? east and certainly 3.5 km south of the international highway next to the Mediterranean Sea. The annual rainfalls were about 120 mm distributed as 80% in winter, 10% in autumn and 10% in the spring. The Evaporation rate is about 182 mm in summer and 69 mm in the winter. Irrigation waters Ec. be 4.2 dSm^{-1}, pH was 7.77 and So_4 was 0.98. Field experiments assigned to a strip–plot design with three replication used. Now the horizontal strips the three stubble-height treatments, i.e. 20, 40 and 60 cm from ground level. In the vertical strips, the three irrigation treatments were laid at three evaporation rates of 1.00, 0.67, 0.33 ET.

Studied Characters

At each cut five samples of study character of 2014, 2015 and 2016 seasons measured as follows, plant height (Cm). Stem thickness (mm). Chlorophyll contents of a leaf sample estimated by SPAD-502 apparatus (Minolta Co. Ltd., Osaka, Japan). Foliage fresh and dry weight in kg/plant. Foliage fresh and dry weight t/ha. 100-gram sample of both leaves and stems fresh materials collected from plants were oven dried at 70^0 C until constant weight to find dry weight. Additionally, plant height (m) and average foliage diameters recorded. The water use efficiency (WUE) estimated at different treatments by the follows equation:

$$WUE = \frac{Y}{W}$$

Where WUE is water use efficiency as mm of equal water depth per Kg of yield, y is the green or dry yield and w is the equivalent water depth in mm.

Nitrogen estimated as the described method by Koch and McMeekin (1924), then crude protein percent calculated by multiplying total nitrogen percent x 6.25 as pronounced by Bolton (1962), then the protein in kg/ha designed by multiplying protein % x dry matter yield (kg/ha). Ether extracts (EE) were estimated using Soxhelt apparatus used for will power of an ether extracts, percent, according to official and tentative methods of the American Oil Chemists (AOAC, 2000). Ether extracts from kg/ha calculated by multiplying ether extract percentage x yields of dry matter (kg/ha). Crude fiber (CF) estimated using the

usual Weende method. Moreover, crude fiber from kg/ha intended by multiplying crude fiber percentage x dry matter yield (kg/ha). The method of official and tentative methods of the American Oil Chemists (AOAC, 2000) was used to determine ash contents and rendering to ash in kg/ha intended by multiplying ash percentage x dry matter yield (kg/ha). Nitrogen free extracts (NFE) calculated by = 100 – (crude protein percent + crude fiber percent + ether extract percent + ash percent). Then, yield/ha was intended by multiplying nitrogen free extract percentage x dry matter yield (kg/ha).

Experimental analysis

Obtained data exposed to analysis of variance and means to compare using Least Significant Differences (LSD) test for the 5% level according to Gomez and Gomez (1991). The data analyzed statistically after the strip-plot in a Randomized Complete Block Design by MSTAT-C computer package established by Russel (1986). At the three seasons, a combined analysis statically analyzed according to Waller and Duncan (1969).

Results

Cuttings effects

Different cuttings significantly exaggerated plant height, stem thickness, green and dry matter forage yield/ha, WUE, ether extract and ash percentages, as well as ash yield/fed during 2014, 2015 and 2016 seasons as shown in Tables 1, 2 and 3. The tallest plant (137.3 cm), thick stems (13.7mm), the highest weight of green forage yield/ha (4.797 t/ha), the highest weight of dry forage yield/ha (2.852 t/ha) and the highest values of water use efficiency (1.27), was found from the first cut. Whereas, the second cut recorded the highest ether extracts (8.40%) and ash (10.76) percentages and ash yield/ha (33.79 kg/ha). However, the results clearly indicated that cutting did not affect significantly green and dry matter forage yield/plant, percentages of protein and fiber and nitrogen free extract and yield/ha from protein and fiber, ether extract and ash.

TABLE 1

Means of plant height, stem thickness, chlorophyll concentration and green forage yield/plant, green and forage yield/ha as affected by cuttings, irrigation treatments and stubble height during combined of 2014, 2015 and 2016 seasons

Treatments	Plant height cm	Stem thickness mm	Green forage yield kg/plant	Dry forage yield kg/plant	Green forage yield t/ha	Dry forage yield t/ha
A. Cuttings						
1st cut	137.3	13.9	4.22	2.46	4.797	2.852
2nd cut	131.2	13.7	5.30	2.45	4.764	2.832
3rd cut	129.5	13.3	4.21	2.43	4.783	2.799
F-Test	*	*	NS	NS	*	*
LSD 5%	0.2	0.2	-	-	0.036	0.015
B. Irrigation treatments						
1.00 ET	147.7	14.9	5.78	3.19	5.304	3.727
0.67 ET	130.5	13.4	4.22	2.20	4.754	2.571
0.33 ET	119.6	12.7	3.65	1.94	4.145	2.208
F-Test	*	*	*	*	*	*
LSD 5%	0.4	0.4	0.41	0.51	0.070	0.045
F-Test Ax B	*	*	NS	*	*	*
C. Stubble height						
Cutting at 20 cm	134.8	13.7	4.59	2.26	5.026	2.991
Cutting at 40 cm	134.9	13.9	4.69	2.76	5.143	3.202
Cutting at 60 cm	128.1	13.2	4.46	1.94	4.178	2.293
F-Test	*	*	*	*	*	*
LSD 5%	0.4	0.2	0.41	0.55	0.061	0.038
F-Test A x C	*	NS	NS	*	*	*
F-Test B x C	*	*	NS	*	*	*
F-Test A x B x C	NS	NS	NS	NS	NS	NS

NS=Not significant, *Significant at 5%.

TABLE 2
Means of water use efficiency, percentages of protein, fiber, ether extract, ash and nitrogen free extract as affected by cuttings, irrigation treatments and stubble height during combined of 2014, 2015 and 2016 seasons

Treatments	WUE %	Crude Protein %	Crude fiber %	Ether Extract %	Ash %	N. F. E. %
A. Cuttings						
1st cut	1.27	12.82	28.63	7.27	11.02	40.25
2nd cut	1.25	12.68	28.71	7.44	10.76	58.41
3rd cut	1.24	12.66	28.79	7.42	10.52	58.51
F-Test	*	NS	NS	*	*	NS
LSD 5%	0.01	-	-	0.02	0.02	-
B. Irrigation treatments						
1.00 ET	1.24	13.09	26.99	6.76	10.67	42.49
0.67 ET	1.28	12.64	29.35	7.58	10.79	39.66
0.33 ET	1.25	12.43	29.83	7.79	10.83	39.11
F-Test	*	*	*	*	*	*
LSD 5%	0.01	0.02	0.05	0.02	0.02	0.05
Interaction F-Test A x B	*	NS	NS	NS	NS	NS
C. Stubble height						
Cutting at 20 cm	1.32	12.82	28.46	7.30	10.54	40.86
Cutting at 40 cm	1.43	12.76	28.76	7.36	11.29	39.85
Cutting at 60 cm	1.02	12.59	28.92	7.47	10.46	40.56
F-Test	*	*	*	*	*	*
LSD 5%	0.02	0.02	0.04	0.02	0.03	0.05
Interaction A x C	*	NS	NS	NS	NS	NS
Interaction B x C	*	*	*	*	NS	NS
Interaction A x B x C	NS	NS	NS	NS	NS	NS

NS=Not significant, *Significant at 5%.

Irrigation treatments

Irrigation treatments significantly exaggerated plant height, stem thickness, forage, green and dry yield/plant and per hectare, WUE, and forage quality %, the yield/ha of protein and fiber, ether extract, ash and nitrogen free extract during 2014, 2015 and 2016 seasons (Tables 1, 2 and 3). Irrigation at 1.00 ET produced the tallest plants (147.6 cm), thick stems (14.9 mm). The largest forage green and dry matter yield/plant (5.78, 3.19 kg/plant, respectively), forage green and dry matter yield/ha (5.304, 3.727 t/ha, respectively). The highest percentages of crude protein (13.09 %), nitrogen free extract (42.49%), highest protein yield (46.82 kg/ha), fiber yield (96.5 kg/ha), ether extract yield (24.16 kg/ha), ash yield (38.2 kg/ha) and nitrogen free extract yield (152.04 kg/ha). Whereas, irrigation at 0.678 Et produced the highest water use efficiency (1.29). In addition, the results revealed that higher percentages from ether extracts percentage (7.79 %), crude fiber percentage (29.83 %) and ash percentage (10.83%) gotten from irrigation at 0.33 ET.

Stubble height effect

The obtainable results from Tables 1, 2 and 3 obviously displayed that the stubble height significantly affected plant height, stem thickness, forage green and dry matter yield/plant and per hectare, the highest values of water use efficiency, forage quality percentage, yield kg/ha of protein and fiber, ether extract and nitrogen free extract. The tallest plant, thickness stems, the highest weight of green and dry forage yield/plant, green and dry matter forages yield/ha, the highest values of WUE, protein, ash percentage, protein, fiber and ether extract yield/ha gotten from cutting at 40 cm height. Meanwhile, cutting at 60 cm stubble height produced the highest percentage of crude fiber and ether extract. However, the uppermost percentage of nitrogen free extract obtained from cutting at 20 cm stubble height. However, the lowest nitrogen free extract percentage obtained from a stubble height of 60 cm stubble height except nitrogen free extract percentage.

TABLE 3
Means of yield/ha of protein, fiber, ether extract, ash and nitrogen free extract as affected by cuttings, irrigation treatments and stubble height during combined of 2014, 2015 and 2016 seasons

Treatments	Protein kg/ha	Fiber kg/ha	Ether Extract kg/ha	Ash kg/ha	N.F.E. kg/ha
A. Cuttings					
1st cut	35.35	77.76	19.89	30.16	110.20
2nd cut	34.82	77.16	20.16	33.79	158.80
3rd cut	34.58	76.36	19.94	28.24	157.27
F-Test	NS	NS	NS	*	NS
LSD 5%	-	-	-	0.77	-
B. Irrigation treatments					
1.00 ET	46.82	96.50	24.16	38.20	152.04
0.67 ET	31.08	71.92	18.69	31.01	97.84
0.33 ET	29.30	62.85	16.48	23.88	82.87
F-Test	*	*	*	*	*
LSD 5%	3.72	9.22	0.19	0.74	7.76
Interaction F-Test A x B	NS	NS	NS	NS	*
C. Stubble height					
Cutting at 20 cm	37.10	80.83	20.952	30.09	117.26
Cutting at 40 cm	39.48	87.72	22.608	29.78	122.49
Cutting at 60 cm	28.17	62.71	16.416	27.52	89.25
F-Test	*	*	*	NS	*
LSD 5%	3.14	7.61	0.36	-	8.39
Interaction A x C	NS	NS	*	NS	*
Interaction B x C	NS	*	*	*	*
Interaction A x B x C	NS	NS	NS	NS	NS

NS=Not Significant, *Significant at 5%.

Interaction effects

Interaction among cuttings and water deficits

The interaction among cuttings and irrigation treatments, the results from Tables 1, 2 and 3 clearly specified that this interaction insignificantly exaggerated forage green yield/plant, forage quality % and yield in kg/ha of protein and fiber, ether extract and ash during 2014, 2015 and 2016 seasons. A significant effect due to the interaction between cutting and irrigation treatments on plant height, stem thickness, forage green and dry yield/plant as well as values of water use efficiency. The obtainable results from Tables 1 and 2 the interaction among cutting and water deficit significantly exaggerated plant height, stem thick, green and dry forage yield/plant as well as water use efficiency during 2014, 2015 and 2016 seasons. The interaction among cutting and water deficit on forage green and dry yield/ha, the resulted graphically illustrated in Figs 1 and 2 clearly showed that the interaction among cutting and water deficit significantly affected forage green yield/ha. The results clearly the signpost that highest forage green and dry yield in kg/ha produced from irrigation 1.00 ET and during the first cut. Nevertheless, the lower most forage green and dry yield in kg/ha produced from irrigation with 33% ET and the first cut during 2014, 2015 and 2016 seasons.

Interaction between cuttings and stubble height effects

The presented results from Tables 1, 2 and 3 clearly designated that the interaction among cuttings and stubble highest insignificantly affected stem thickness, forage green yield/plant, forage quality % and nitrogen free extract% and forage yields in kg/ha of protein, fiber and ash of 2014, 2015 and 2016 seasons. The interaction among cuttings and stubble height effect on plant height and dry forage yield/plant, the obtainable resulted from Tables 1, 2 and 3 clearly disclosed that the interaction among cuttings and stubble height significantly affected plant height, dry forage yield/plant, values of water use efficiency, ether extract and nitrogen free extract yields in kg/ha. The interaction among cuttings and stubble height effect on forage green and dry yields in kg/ha. The results presented in Figs 3 and 4 clearly showed that the interaction among cuttings and stubble height significantly affected green forage yield/ha. Higher forage green and dry yield/ha (5.186, 3.247 t/ha at both seasons, respectively) were produced from the first cut and cutting at 40 cm stubble height. On the other hand, the lowest yields of both forage green and dry/ha (4.137, 2.181 t/ha at both seasons, respectively) produced from the second cut and cutting at 60 cm stubble height.

Interaction among water deficit and stubble height effects

The accessible results from Tables 1, 2 and 3 clearly designated that the interaction between water deficit and stubble height insignificantly affected forage green yield/plant, percentages of ash and nitrogen free extract as well as yield to kg/ha of protein. The interaction effects among water deficit and stubble height on plant height, stem thick, forage dry yield/plant, The accessible results from Tables 1, 2 and 3 clearly designated that the interaction between water deficit and stubble height insignificantly affected forage green yield/plant, percentages of ash and nitrogen free extract as well as yield to kg/ha of protein.

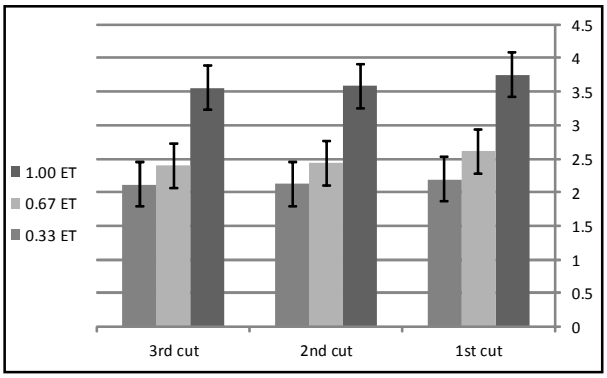

Fig. 1. Mean of green foliage yield t/ha as affected by the interaction between cuttings and irrigation treatments as combined of 2014, 2015 and 2016 seasons.

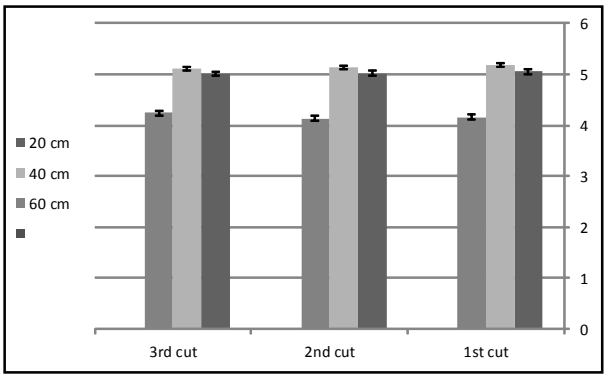

Fig. 2. Mean of dry matter foliage yield t/ha as affected by the interaction between cuttings and irrigation treatments as combined of 2014, 2015 and 2016 seasons.

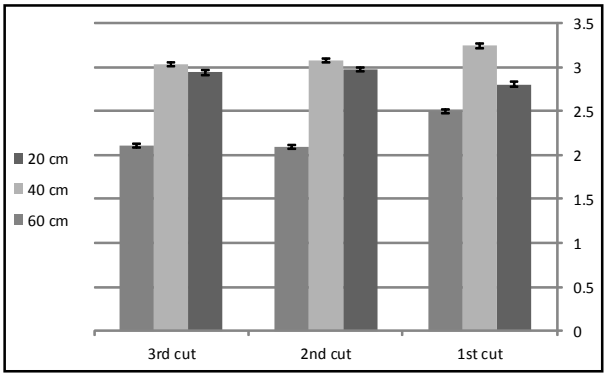

Fig. 3. Mean of green foliage yield t/ha as affected by the interaction between cuttings and stable height as combined of 2014, 2015 and 2016 seasons.

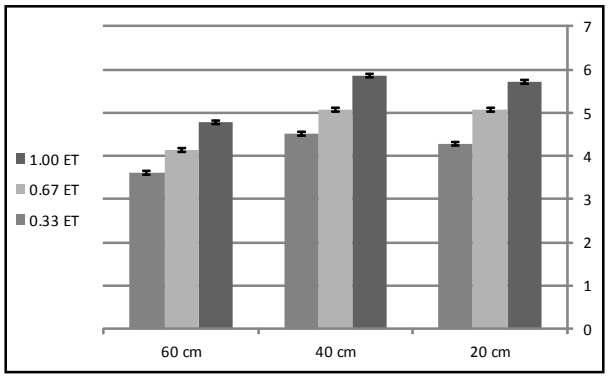

Fig. 4. Mean of dry matter foliage yield t/ha as affected by the interaction between cuttings and stable height as combined of 2014, 2015 and 2016 seasons.

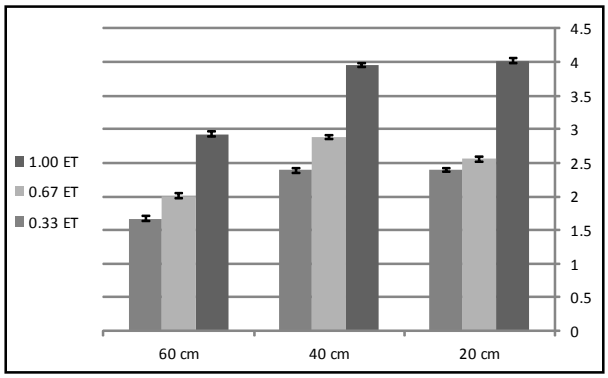

Fig. 5. Mean of green foliage yield t/ha as affected by the interaction between stable height and irrigation treatments as combined of 2014, 2015 and 2016 seasons.

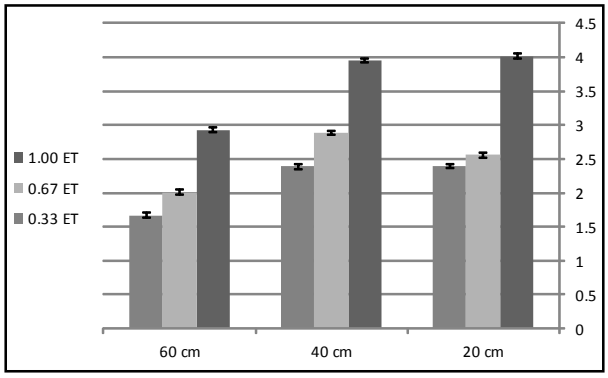

Fig. 6. Mean of dry matter foliage yield t/ha as affected by the interaction between stable height and irrigation treatments as combined of 2014, 2015 and 2016 seasons.

The interaction effects among water deficit and stubble height on plant height, stem thick, forage dry yield/ plant, WUE, protein%, fiber% and ether extract%, yield to kg/ha of forage quality. The presented resulted from Tables 1, 2 and 3 clearly showed that the interaction between water deficit and stubble height significantly pretentious plant height, stem thick, forage dry yield/plant, WUE, protein%, fiber and ether extract %, yield in kg/ha of forage quality. However, the lowest values of the above-mentioned parameters produced from cutting with 60 cm stubble height and irrigation at 0.33 ET. The interaction effects among water deficit and stubble height on forage green and dry matter yield/ha. The resulted graphically illustrated in Figs.5 and 6 obviously displayed that the interaction between water deficit and stubble height significantly affected forage green and dry yield in kg/ha during 2014, 2015 and 2016 seasons. The highest weight of

forage green and dry yield in kg/ha (5.846 and 4.117 kg/ha, respectively) formed from cutting into 40 cm stubble height and irrigation at 1.00 ET during 2014, 2015 and 2016 seasons. However, the lowest values of the aforementioned parameters created from cutting with 60 cm stubble height and irrigation at 0.33 ET.

Interaction between cuttings, irrigation treatments and stubble height effects

The presented results from Tables 1, 2, and 3 obviously designated that the interaction among cuttings, irrigation treatments and stubble height insignificantly affected plant height, stem thickness chlorophyll concentration, green and dry matter forage yield/plant, green and dry matter forage yield/ha during 2014, 2015 and 2016 seasons.

DISCUSSIONS

The tallest plant, thick stems, the highest weight of green forage yield/ha, the highest weight of dry forage yield/ha and uppermost ethics of water use efficiency obtained from the first cut. The results clearly showed that uppermost percentages of ether extract and higher ash yield/ha were shaped from the second cut may due to dry matter production of *Acacia saligna* under irrigation was only 14% greater than under dry land. Dry matter manufactures were significantly abridged, water use efficiency and chlorophyll content augmented with abridged availability of water (Nativ et al., 1999). In addition, Duguma et al. (1988) concluded that cutting frequency has a main result from the highest green forage yield. Whilst, cutting the intensity affects the forage dry matter yields. Nduwayezu et al. (2005) found that increase from forage dry matter yield by cutting stubble height of 75 cm after which it declined. Cutting Senna plants with 75 cm height maximized both its potential for failure biomass production, pruning N contribution. Whereas, Lazaridou et al. (2012) point out those cutting parameters, such as timing, frequency and intensity affect water use efficiency, as they affect the harvest biomass and evapotranspiration. Nevertheless, water use efficiency, dissimilar, markedly, contingent on plant, soil, climatic issues and management performs. Recently, Muir (1998) concluded that cutting heights of 0.3 m, 0.6 m and 1.0 m overlaid on 3 months and 6 months cutting frequencies on mature rows for three years. Cutting height had an effect on forage yield. It could be noticed that irrigation at 1.00 ET produced the tallest plants, thick stems, the highest green and dry matter forage yield/plant, green and dry matter forage yield/ha, crude protein and nitrogen free extract %, yield in kg/ha of forage quality during 2014, 2015 and 2016 seasons. Li et al. (2005) opinion out that higher drought tolerance employs a conservative water use strategy while lower drought tolerance employs a prodigal water-use strategy. Hussain and Al Jaloud (2011) concluded that the range plants could produce many amounts of fresh biomass with irrigation between 40-60 % moisture depletion of field capacity, thus showing a net saving from 50 % of irrigation water supplies. Andrew et al. (2013) designated that the species had the best morphological growth when treated with 50% soil moisture level and this was not significantly different from seedlings with 100% soil moisture level. The tallest plants, thick stems, the highest weight of green and dry forage yield/plant, green and dry matter forage yield/ha, the highest values of WUE, yield to kg/ha of protein, ash percentage, protein, fiber and ether extract shaped for cutting with 40 cm stubble height. Nduwayezu et al. (2005) suggested that increases in forage dry matter yield produced from cutting with 75 cm stubble height. Lazaridou et al. (2012) found that cutting parameters, such as timing, frequency and intensity affect the values of water use efficiency, as they affect the harvest biomass and evapotranspiration. Nevertheless, the absolute values of water use efficiency very decidedly contingent on plant, soil, climatic influences and management performs.

CONCLUSION

Accordingly, cutting acacia shrubs with 40 cm stubble height of irrigation with 100% ET get the most out of forage dry matter yield/ha and its quality.

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