The effect of nitrogen fertilizing on the productivity of *Trifolium repens*.L in grass mixtures

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Abstract:

The research was carried out at the Abu Jarash farm in the College of Agriculture - Damascus University – Syria, in 2017, with the aim of studying the effect of loading Trifolium repens L. on the productivity of grass-fed mixtures in landscaping cultivation, in the spring and autumn seasons. The study was conducted on two types of plant mixtures, the first: the grass mixture consisting of Festuca arundinacea L., Poa pratensis L., and Lolium perenne L., and the second: the proposed mixture, which is the first mixture loaded with white clover. The experimental plots were subjected to two levels of nitrogen fertilization: the first was the level of fertilization normally used on cultivated green areas /N/, and the second was the first fertilization level in which the added nitrogen was reduced to 50%. Thus, we have 4 treatments and each treatment has 3 replicates; Grass mixture with /N/ fertilizer, proposed mixture with /N/ fertilizer, grass mixture with /N-50%/ fertilizer, proposed mixture with /N-50 %/ fertilizer. The results we obtained showed that the proposed mixture /N / was superior to the rest of the mixtures by green and dry weight in the spring and autumn seasons in terms of yield and weight.

Key words: white clover, Green weight, Dry weight, Landscapes.

Introduction:

The waste of cutting green areas in invested, widely spread in cities, is used as fodder for animals since most of the plants in these areas belong to the Grass family. Most of the grassy species have a good fodder value in general, and thus constitute the bulk of the food eaten by grazing animals such as cows, goats, and horses.

Nitrogen is one of the main nutrients required by forage grasses for proper growth and development. The response of feed yield and quality to added nitrogen is often substantial, unlike the other two major nutrients, phosphorous and potassium, where nitrogen is not retained in the soil from year to year in a form that can be easily used by forage plants. The nitrogen added to the soil is quickly converted to nitrate and then often mixed with organic matter, which is seeped from the rooting zone by precipitation. Nitrogen can be added to forage grasses by adding legumes such as clover or alfalfa, which can fix it directly from the air (Savoy, 2007). 30% of legumes can provide about 30-50 pounds of nitrogen per year for grasses in pastures. Recycling nitrogen from urine, manure, decomposing plants, etc. saves an additional 15-30 pounds of nitrogen per year depending on the number of cows and frequency of grazing (Barnett, 2006). These plants are distinguished by their ability to fix atmospheric nitrogen because of the symbiosis of their roots with Rhizobium bacteria (Andrews *et al* ., 2011).

Recent University of Wisconsin research shows a positive economic return with up to 100 pounds of an acre of nitrogen fertilizer applied to mixed pastures. This paper provided information comparing the cost of intercropping legumes with the cost of using nitrogen fertilizers. It turns out that spreading legumes on irrigated pastures is cheaper than putting in 50 pounds of nitrogen per acre. Whereas nitrogen applications are more effective in increasing total dry matter yield, inter-legumes improve the seasonal distribution of forage dry matter by increasing summer production on pastures and improving protein levels and feed digestibility (Barnett, 2006).

Research Objective:

Studying the effect of loading white clover with aggregate mixtures used in landscaping cultivation, in studying the amount of mowing residues.

Materials and methods:

Mowing machine (available at the College of Agriculture), model scale (sartorius CP 16001 S. Max=1000 g) measuring with 0.01 precision, electric dryer (Memmert company), Paper bags in which samples are placed after drying, identification cards for the studied mixtures and levels of fertilization, forms to record measurements on them. Use the NPK compound fertilizer in the following proportions in order (51%, 46%, 51%).

Site soil:

Random soil samples were collected from the studied site at a depth of (0-30) cm before planting and analyzed in order to know some indicators. Table (1) shows the results of the chemical analysis of the soil of the studied site:

Table (1): Chemical analysis of the soil of the studied site before planting

Depth (0-30) cm	K mg.kg-1	P mg.kg-1	N %	electrical conductivity dS/m Extract 5:1	PH Suspended 2.5:1	organic matter %
soil before planting	316.1	1.45	0.3	0.341	7.65	**0.35**

Experiment:

The seeds of each study mixture were sown separately and with longitudinal strips (5 m long and 1 m wide = experimental plot), with a rate of three replications for each mixture. The experimental plots were subjected to two levels of nitrogen fertilization, the first being the level of fertilization normally used on cultivated green areas (100% N), and the second being the level of the first fertilization in which the percentage of added nitrogen was reduced to 50%. Then we have 6 experimental plots for each mixture And 12 trial pieces in total. The seeds were mixed as follows: 1000 g of a suggested mixture = 800 g of a grass mixture + 200 g of white clover, meaning that the addition of white clover was one-fifth of the proposed mixture. The seeds were sown in early October 2017, at a rate of one kilogram of seeds for every 20 to 25 square meters of area in our country. The irrigation process was carried out on a daily and regular basis, except for the days of rain. We fertilized it once at the beginning of each month, starting from March to November of 2018, according to the quantities required for each experimental plot. The green areas were mowed at a height of 3-5 cm once every 15 days, starting from March 15 to November 30, 2018, with an average of 10 cuts distributed over the spring and autumn seasons of 2018, equivalent to 5 cuts per season and 12 cut samples during each mowing date. , equivalent to 120 samples in total during the experiment. The cutting residues were collected and the cut parts were placed in bags with identification cards written on the date of the mowing, the number of the mowing, the level of fertilization, the name of the cultivated mixture (commercial / suggested), and the number of the

repeater. The green weight of each replicate was determined utilizing a sensitive electronic balance, then the samples were placed in an air dryer for 48 hours at a temperature of 70 °C, and then the dry weight of each sample was determined.

Statistical analysis:

The COMPLETE RANDOMIZED DESIGN (CRD) was used in the design of the experiments, and the results were analyzed by using the analysis of variance (ONE-WAY ANOVA) test using SPSS V22, according to the least significant difference (L.S.D) and the coefficient of variation (%C.V) at the level of significance (5%).) to compare the four parameters.

Results and discussion:

Determination of green and dry weight of plant mixtures in spring:

Table 2: Determination of the green and dry weight of the studied samples in the spring season

Season	Mix type	Grass mixture N%	Suggested mixture N%	Grass mix N-50%	Suggested mix N-50%	L.S.D	CV%
Spring	Average green weight for 5 cuts	$0.189^{c}\pm0.004$	$0.283^{a}\pm0.004$	$0.127^{d}\pm0.004$	$0.266^{b}\pm0.004$	0.0056	1.9
	Average dry weight for 5 cuts	$0.054^{c}\pm0.001$	$0.0830^{a}\pm0.001$	$0.031^{d}\pm0.001$	$0.066^{b}\pm0.001$	0.0071	9.1

The different letters within the same row indicate the presence of significant differences at the 5% ($p \leq 0.05$) level of significance.

Green weight in spring:

Table (2) and Figure (1) show that the plants of the proposed mixture /N/ outperformed, with significant differences, the plants of the rest of the mixtures, reaching an average of (0.283) g/m^2, followed by the proposed mixture /N-50/, where the average weights reached (0.266). g/m^2, then the grass mixture /N/ with an average of (0.189) g/m^2, and finally the grass mixture /N-50/ with an average of (0.127) g/m^2.

Dry weight in spring:

Table (2) and Figure (2) show that the plants of the proposed mixture /N/ outperformed with significant differences over the plants of the rest of the mixtures, reaching an average of (0.0830) g/m^2, followed by the proposed mixture /N-50/, where the average weights reached (0.066). g/m^2, then the grass mixture /N/ with an average of (0.054) g/m^2, and finally the grassy mixture /N-50/ with an average of (0.031) g/m^2.

These results are in agreement with the results of the experiment conducted at Malopolska station near Krakow, where nitrogen fertilization at a rate of 110 kg/ha, applied in early spring, increased root density by 31 to 64%, spike width from 12 to 85%, length Heads twice, and two- to five-fold increase in seed yield, in a study on three forage cultivars of Poa pratensis L. (Grygierzec, 2011). It also agrees with the findings of (Moore *et al* ., 2006).that white clover has a good value in providing high quality feed in mixed pastures, especially in the spring.

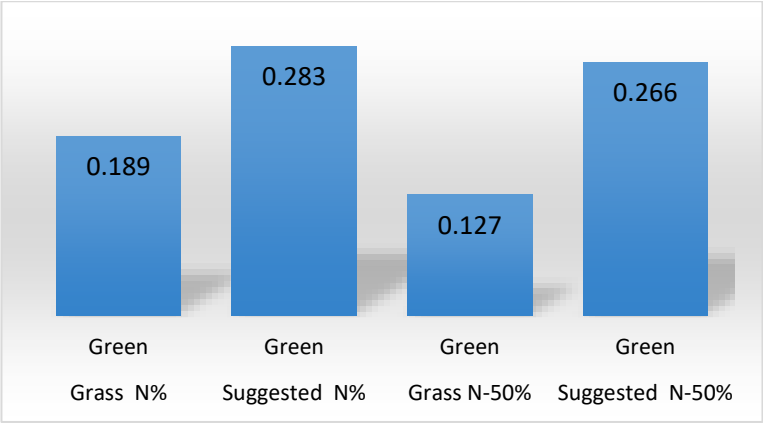

Figure (1): The average green weight of cut parts in the spring

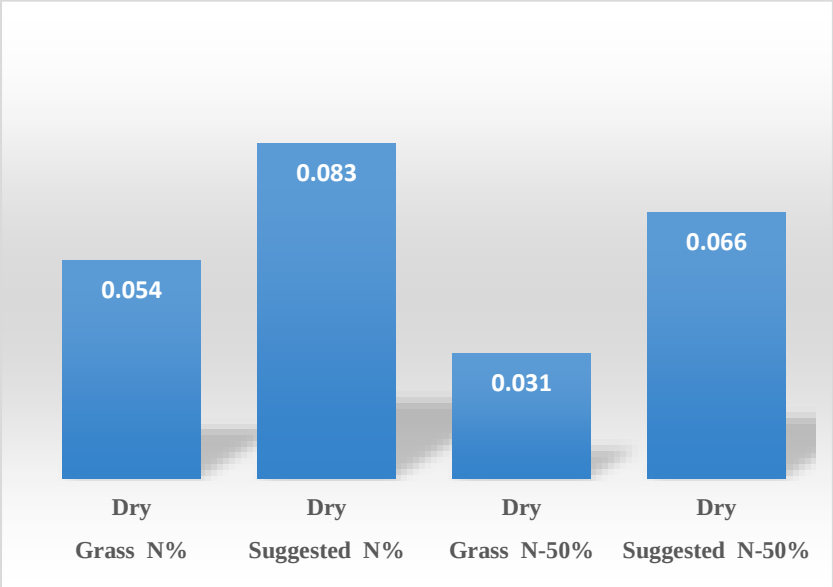

Figure (2): The average dry weight of cut parts in the spring

Determination of green and dry weight of plant mixtures in autumn:

Table (3):Determination of the green and dry weight of the studied samples in the autumn season

Season	Mix type	Grass mixture N%	Suggested mixture N%	Grass mix N-50%	Suggested Mix N-50%	L.S.D	CV%
Autumn	Average green weight for 5 cuts	$0.202^{c}\pm0.007$	$0.274^{a}\pm0.007$	$0.186^{d}\pm0.007$	$0.259^{b}\pm0.007$	0.0092	3
	Average dry weight for five cuts	$0.092^{bc}\pm0.01$	$0.109^{a}\pm0.01$	$0.083^{c}\pm0.01$	$0.105^{ab}\pm0.01$	0.0134	10.3

The different letters within the same row indicate the presence of significant differences at the 5% ($p \leq 0.05$) level of significance.

Green weight in autumn:

Table (3) and Figure (3) show that the plants of the proposed mixture /N/ outperformed, with significant differences, the plants of the rest of the mixtures, reaching an average of (0.274) g/m^2, followed by the proposed mixture /N-50/, where the average weights reached (0.259). g/m^2, then the grass mixture /N/ with an average of (0.202) g/m^2, and finally the grassy mixture /N-50/ with an average of (0.186) g/m^2.

Dry weight in autumn:

The data of Table (3) and Figure (4) indicate that the proposed mixture /N/ outperformed by significant differences both the grass mixture /N/ and the grass mixture /N-50/, where the average weights were (0.109) g/m^2, while it was not observed Any significant differences between it and the proposed mixture /N-50/. In comparison, we find that the proposed mixture /N-50/ outperformed by significant differences over the grassy mixture /N-50/, while no significant differences were recorded with the grassy mixture /N/ where the average weights reached (0.105) g/m^2, and the differences were Between the grass mixture /N/ and the grass mixture /N-50/ is apparent, as the average weights in each of them were (0.092, 0.083) g/m^2.

These results agree with the findings of (Razec *et al* ., 2002). in studying the effect of nitrogen fertilization on Festuca arundinacea L. and a group of mixtures thereof with different types of legumes. The results showed a positive effect of loading legumes on the studied Grass species, as Trifolium repens L. white clover contributed to an increase in productivity by 2170 kg/ha compared to those of pure festoca cultivations.

These results are also in agreement with the experiments conducted at the University of Latvia on the grass cover of perennial rye L. Lolium perenne, and the results concluded that the nitrogen fertilization led to an improvement in the quantitative and qualitative characteristics of the vegetation, as the amount of forage production increased (Bumane, 2010).

In general, legumes can compete with weeds, even with relatively high nitrogen levels. Herbal mixtures of legumes increase yields by about 15% compared to either of them grown alone (Tranel, 2000).

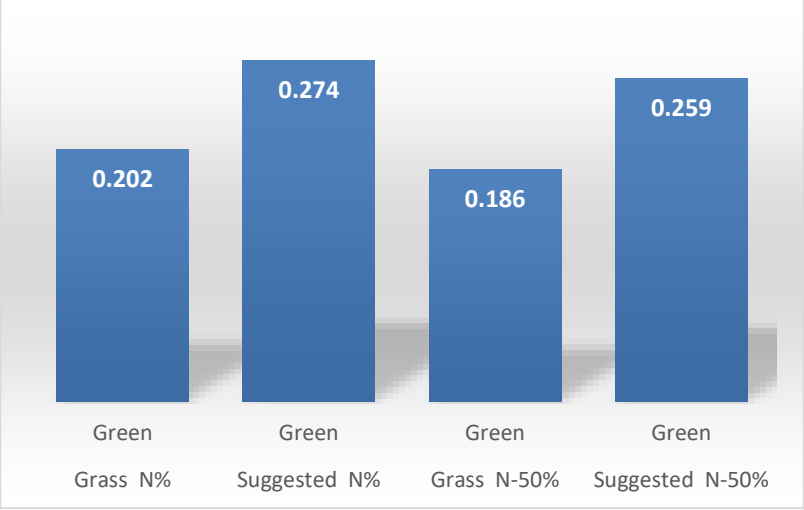

Figure (3):The average green weight of cut parts in the autumn

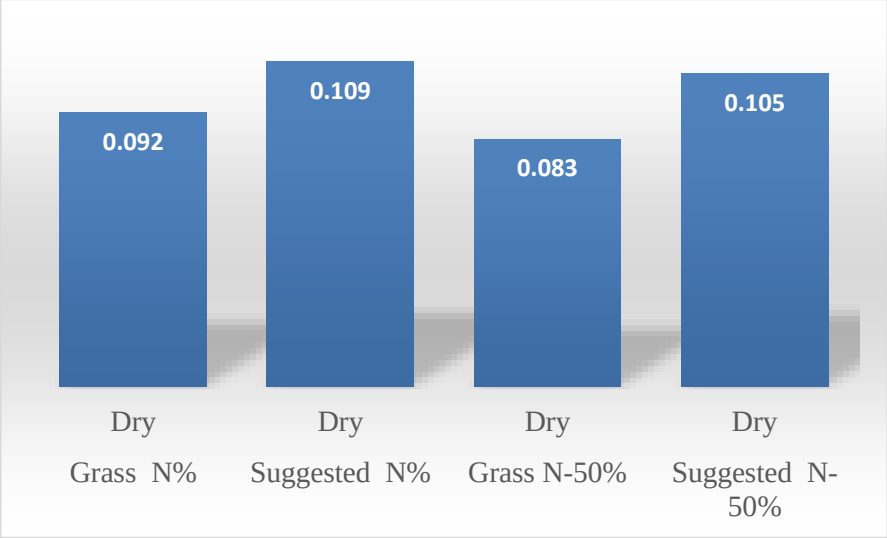

Figure (4): The average dry weight of cut parts in the autumn

Conclusion

The results we obtained showed that the plants of the proposed mixture /N/ outperformed the other mixtures in the spring and autumn seasons in terms of productivity and weight, as the average green and dry weight for five cuts, this indicates the ability of white clover to increase productivity when loaded on grass.

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تأثير التسميد النتروجيني على إنتاجية نبات النفل الأبيض *Trifolium repens* L. في الخلطة النجيلية

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الملخص:

أجري البحث في مزرعة أبي جرش التابعة لكلية الهندسة الزراعية بجامعة دمشق خلال عامي2018-2017 وذلك بهدف دراسة تأثير تحميل النفل الأبيض *Trifolium repens* L.على الخلطات النجيلية المستخدمة في زراعة المسطحات الخضراء، في فصلي الربيع والخريف، أجريت الدراسة على نوعين من الخلطات النباتية، الأولى: الخلطة النجيلية المكونة من الفستوكا القصبية *Festuca arundinacea* L. وقبأ البراري (عشب كنتكي الأزرق) *Poa pratensis* L. والشيلم المعمر (حشيشة الفرس) *Lolium perenne* L. والثانية: الخلطة المقترحة وهي عبارة عن الخلطة الأولى محملاً عليها النفل الأبيض *Trifolium repens* L.خضعت القطع التجريبية لمستويين من التسميد الآزوتي الأول: مستوى التسميد المستخدم بشكل اعتيادي (N%)، والثاني عبارة عن مستوى التسميد الأول مخفضاً فيه نسبة الآزوت إلى 50%(N-50%). وبالتالي أصبح لدينا 4 معاملات ولكل معاملة 3 مكررات: خلطة نجيلية بسماد /N%/، خلطة مقترحة بسماد /N%/، خلطة نجيلية بسماد /N-50%/، خلطة مقترحة بسماد /N-50%/ وذلك خلال فصلي الربيع والخريف. أظهرت النتائج التي حصلنا عليها تفوق الخلطة المقترحة /N/ على باقي الخلطات من حيث الإنتاجية بالوزن الأخضر والجاف في فصلي الربيع والخريف.

الكلمات المفتاحية: النفل الأبيض، الوزن الأخضر، الوزن الجاف، المسطحات الخضراء.

Appendices

1- The soil content of the two mixtures of grass /N/ and grass /N-50/:

Table (1) The results of the T test for the difference between the two mixtures of grass /N/ and grass /N-50/

studied coefficient	Soil mix type	SMA	standard deviation	T value	Moral
N	grass /N/	0.70	0.176	3.56	0.024
	grass /N-50/	0.34	0.024		
P	grass /N/	10.83	0.23	64.91	0.000
	grass /N-50/	9.77	0.20		
K	grass /N/	101.15	0.020	620.61	0.000
	grass /N-50/	91.67	0.173		
PH	grass /N/	9.27	0.011	6.74	0.003
	grass /N-50/	9.16	0.026		
Electrical conductivity	grass /N/	48.9	0.12	42.86	0.000
	grass /N-50/	45.4	0.10		
Organic matter	grass /N/	17.80	0.175	9.19	0.001
	grass /N-50/	16.50	0.171		

2-The content of the soil of the two mixtures proposed /N/ and the proposed /N-50/:

Table (2) T-test results for the difference between the two soil mixtures proposed /N/ and the proposed /N-50/.

studied coefficient	Soil mix type	SMA	standard deviation	T value	Moral
N	/N/ proposed	11.20	0.13	5.422	0.013
	/N-50/ proposed	10.50	0.21		
P	/N/ proposed	10.83	0.01	71.035	0.000
	/N-50/ proposed	10.25	0.01		
K	/N/ proposed	85.357	0.006	460.679	0.000
	/N-50/ proposed	79.820	0.020		
PH	/N/ proposed	9.25	0.178	0.866	0.477
	/N-50/ proposed	9.26	0.012		
Electrical conductivity	/N/ proposed	48.80	0.13	8.573	0.001
	/N-50/ proposed	48.10	0.11		
Organic matter	/N/ proposed	17.50	0.12	24.495	0.000
	/N-50/ proposed	15.50	0.10		

3-The soil content of the two mixtures of grass /N/ and the proposed /N/:

Table (3) T-test results for the difference between the two soil mixtures grass /N/ and the proposed /N/

studied coefficient	Soil mix type	SMA	standard deviation	T value	Moral
N	/N/ grass	0.70	0.171	90.93	0.000
	/N/ proposed	11.20	0.11		
P	/N/ grass	10.83	0.22	44.927	0.000
	/N/ proposed	10.25	0.13		
K	/N/ grass	91.67	0.175	598.935	0.000
	/N/ proposed	85.357	0.005		

PH	/N/ grass	9.16	0.027	4.930	0.011
	/N/ proposed	9.25	0.017		
Electrical conductivity	/N/ grass	45.4	0.10	33.068	0.000
	/N/ proposed	48.1	0.10		
Organic matter	/N/ grass	16.50	0.176	8.66	0.001
	/N/ proposed	17.50	0.100		