Effect of Cutting times and Periods on Growth and Yield Standards of Two Varieties of Clovers (Trifolium Spp(

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Abstract

Economically forage improvement and high-quality yield require adequate knowledge of the right periods in cutting. This experiment was done to estimate growth and yield clover. Clover (Trifolium Spp) is an annual leguminous forage species grown in temperate regions throughout the world and is distinct from other forage crops due to its special properties. It is considered a very interesting crop for its high forage yields when cultivated and for the spread of the harvest over several cuttings, Therefore, in this study, two cutting frequencies and three periods P1(21) days P2 (28) days P3(36) days after first cut cutting were applied on two clover varieties; to investigate some growth characteristics (plant height (cm), number of leaves per plant, fresh weight (g), dry weight (g), fresh yield T/ha, and dry yield T/ha). The results showed that V2 and C2 had the highest number of leaves per plant (26.95 and 35.15) respectively. Also, the highest plant height (cm) was recorded at periods 3 (36) days after the first cut. Furthermore, the fresh yield T/ha, and dry yield T/ha increased in V2 and C2 (0.297 and 2.491) respectively. Finally, for the best development and yield in clover, a 36-day cutting period (P3) is advised. The maximum production was shown by varieties V2 and C2, which had higher fresh and dry yields as well as more leaves and taller plants. These varieties, particularly under the longer cutting period, show great potential for maximizing forage production .

Keywords: Clover, growth, cutting time, varieties, yield

Introduction

Forage crops can include various plants in addition to annual, biennial, and perennial grasses and legumes. Clovers are in the tribe Trifolieae of the family Fabaceae. About 250–300 species are found in the genus. Clover species are herbaceous annuals, perennials, and rarely more than 100 cm tall. Additionally, it adapts well to semi-arid conditions[1]. Clover (Trifolium Spp) is an annual legume, growing over the period autumn to spring [2]. Nigam, Srivastava [3] reported that it is known as the "king of fodders" because of its greatest capacity among fodders and lack of harmful effects. The timing of clover planting varies by region and species. Before the onset of unseasonably cold weather, the young seedlings from the fall sowing should have four to six true leaves [4]. Hoffman and Broderick [5]showed that due to its more vegetative growth, multi-cut character, greater forage production after

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harvest, prolonged time of forage provision, and notable fodder yield, clover is the primary legume fodder grown in south-east Asia .

Clover cultivation has many benefits, including a high yield, the capacity to symbiotically fix nitrogen, and the addition of organic matter to the soil. By fixing atmospheric nitrogen, utilizing conservation crops, and promoting environmentally friendly agriculture in the area, clover dramatically increases soil fertility [6]. The mechanisms of photosynthesis and vegetative development are directly influenced by the nutrient [7]. Kucukduvan and Ates [8]reported that due to its high nutritional content and succulence digestible nutrients—clover fodder is highly palatable. During the winter, the feed is accessible for a bit longer—about 5–6 cuts per season [6].Gondal, Rizvi [9] showed that the simultaneous occurrence of its vegetative and reproductive phases results in deprived seed setting. Interaction between genotype and environment has a significant impact on forage crop productivity and quality[10]. The primary agronomic variable that influences morphology [11]. Iannucci [12] indicated that the DM yield from the crown and roots decreased and the leaf to stem ratio increased as a result of loss of leaves. Cutting is an essential technique for raising fodder and yield [13 . [

It is regarded as a particularly fascinating crop due to its high fodder yields of high quality when grown alone or in mixes, as well as for the way the harvest is distributed across multiple cuttings [14]. Rethwisch, Nelson [15] illustrated that the number of harvests varies amongst clover cultivars as well cultivars are divided into three types single cut, intermediate cut, and multiple cuts. Marković, Štrbanović [16] showed that the first one was cut after 22 days, the second one after 29 days, and the third one after 36 days following the initial cut it is easily digestible, has a high nutritional content, and is seasonally growable in both spring and autumn. Avtar, Jhrar [17] evaluated ten different traits in clover. It is frequently cut for green forage due to a lack of fodder, which causes loss of vitality and a reduction in the nutrients kept in reserve for seed raw materials[9]. Yadav, Vijay [18] showed that due to increased vegetative growth and decreased seed setting, forage crop seed yields are often low. Iannucci [12] showed that all cultivars' dry matter accumulation was significantly impacted by the developmental stage at cut. Ranjbar [19] showed that a higher utilization of nitrogen levels resulted in a higher production of fresh fodder in clover. When determining the overall forage yield, it's vital to take into account the stage of growth at which a forage crop is taken for livestock feeding. This study's objective was to contrast the growth characteristics and yield of two types of clover under various cutting frequency and periods .

Materials and Methods

Two varieties of clover (Trifolium Spp) as the plant material (V1 and V2), two cutting times first and second cut (C1 and C2), and three cutting periods (p1, p2, p3) (p1) 21 days after the first cut, (p2) 28 days after the first cu, and (p3) 36 days after the first cut were used. In regards to the application of nitrogen fertilizer with the rate of was used as a basal application in a basal fertilizer containing N (50 kg ha-1). The experiment was conducted at South east of Erbil (Daratu) location located

at (Latitude 36°7′9.402″ N Longitude 44°4′2.922″ E) and evaluation of 449 meters above sea level. Three replications of a completely randomized block design (RCBD) were used and applied in the plots. Seeds were planted in the summer of 2023. Every plot has four rows, each row has 5 plants, and each plot contains 20 plants .

Statistical Analysis

All of the study's data were gathered and statistically examined using Minitab 19 (Minitab, 2014) and the analysis of variance (ANOVA) technique for randomized complete block design (RCBD). The Tukey multiple range test indicated that the mean comparison was satisfied at the significant 0.05 level .

Results and Discussion

Effects of cutting times, periods, and varieties on plant height (cm.(

Plant height (cm) fluctuates significantly over time. However, Table 1 shows that plant height was not significantly impacted by cutting frequency, variety, or their interaction. The findings of the VP interaction on plant height in Figure (1A) demonstrated that the interaction treatments had a substantial impact on plant height at different times. The plant height of V2P3 had the highest at 68.300 cm, while V2P1 was the lowest at 53.03 cm. The findings show that preferred growth temperatures raise plant height over extended periods; P3 produced higher plant heights than P1.

The outcomes align with the findings of [20] they investigated selection among clover populations to create highly productive ones and found that the greatest plant height (103.16 cm). Furthermore, the outcomes concur with [21

Table 1. Effects of cutting times, periods and varieties on plant growth parameters.

Parameters	V1		V2	
	C1	C2	C1	C2
Plant height (cm)	49.33^{a}	53.53^{a}	53.46^{a}	53.03^{a}
Number of leaves per plant	8.13^{c}	28.16^{b}	11.76^{c}	42.13^{a}
Fresh leave weight (g)	0.98^{b}	3.15$^{a\ b}$	2.27$^{a\ b}$	4.96^{a}
Fresh stem weight(g)	2.01^{b}	4.26$^{a\ b}$	4.32$^{a\ b}$	7.49^{a}
Dry leave weight(g)	0.24^{b}	0.89$^{a\ b}$	0.53$^{a\ b}$	1.24^{a}
Dry stem weight(g)	0.35^{b}	1.00$^{a\ b}$	0.67$^{a\ b}$	1.48^{a}
Leaf /stem ratio	0.70^{b}	0.88^{a}	0.78$^{a\ b}$	0.82^{ab}
Total fresh yield t/ha	0.07^{b}	0.20$^{a\ b}$	0.13$^{a\ b}$	0.29^{a}
Total dry yield t/ha	0.60^{b}	1.48$^{a\ b}$	1.31^{ab}	2.49^{a}

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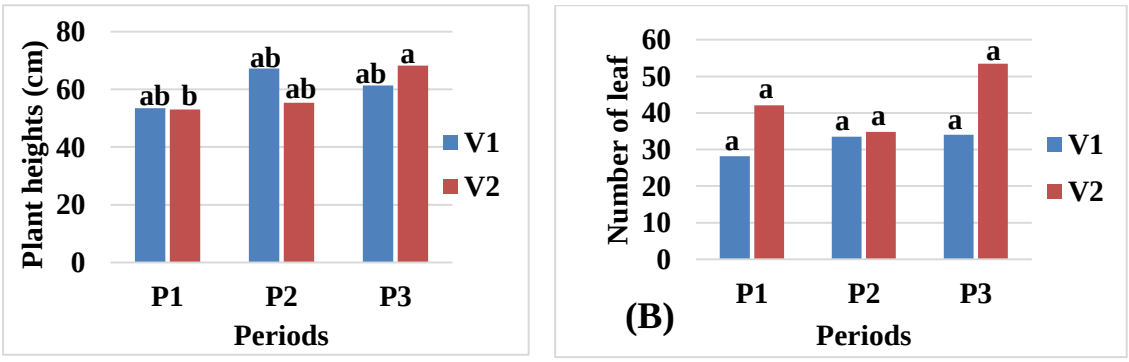

Figure 1. The effects of varieties and periods on (A) plant height (cm) and (B) number of leaves. Bars with different letters show a significance level of ≤ 0.05 between means .

Effects of cutting times, periods and varieties on the number of leaves per plant

The results of the treatments are displayed in Figure (1B). The number of leaves per plant was not significantly affected by times for varieties. Although only varieties had a significant impact on the number of leaves per plant, V2 had the highest value (43.47) and V1 had the lowest value (31.91). However, the effects of cutting frequency and variety on the number of leaves per plant, as well as the interaction between the two variables, revealed that V2C2 had the highest Effects of cutting times, periods and varieties on fresh leaf weight (g(

Table 1 shows that fresh leaf weight was significantly impacted by cutting frequency and variety alone. Additionally, it was shown that the interactions of CV did not differ much. The greatest value, 3.61 g, was recorded by V2, and the highest value, 4.05 g, was recorded by C2. However, the fresh leaf weight does not change significantly with time [

value (42.13) and V1C1 had the lowest number of leaves (8.13.(

The findings indicate that the number of leaves was mainly influenced by the cutting treatment and cutting development stage, and that second cuts yielded more than first cuts because of the ideal temperatures for clover establishment and growth. Table 1 demonstrated that the varietals, cutting frequency, and their interactions all had a significant effect. quantity of leaves. The value between both varieties for the number of leaves showed that V2 gave a higher value than V1.

(period). V2 recorded the highest value (4.76 g). Figure (2A) 's findings demonstrated that this growth characteristic of the interaction treatments VP did not significantly alter the parameter. Leghari, Soomro [7] demonstrated that the clover plants could produce highly green fodder from many cuttings. The increase in vegetative growth will result in low seed production (Yadav, Vijay [18

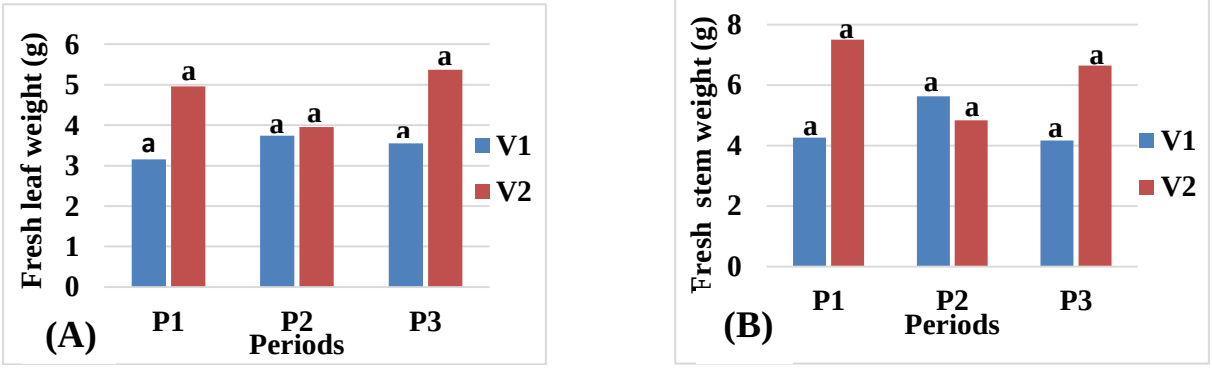

Figure 2. The effects of varieties and periods on (A) fresh leaf and (B) fresh stem weight (g). Bars with different letters show a significance level of ≤ 0.05 between means.

Effects of cutting times, periods and varieties on fresh stem weight (g(

Cutting times and variety type alone had a significant effect on fresh stem weight (g), as Table 1 showed. V1 3.13 g and C1 3.16 g recorded the lowest values. Moreover, there was no significant difference in the interaction of cutting time and variety. The results shown in Figure (2B) also showed that this growth parameter was not significantly changed by the interaction treatments VP. While V2 recorded the highest score 6.32 g for periods only, V1 recorded the lowest value 4.68 g .

Effects of cutting times, periods and varieties on dry leaf weight (g(

Table 1 shows that the outcomes of variety and cutting times. only cutting frequency alone had a substantial impact on the dry leaf weight (g), the highest value was obtained in C2 1.06 g, while the interaction of cutting frequency and varieties were not significantly different. There were no significant effect of interaction periods and varieties the results shown in Figure (3A). Additionally, V2 1.25 g recorded the highest dry leaf weight and V1 0.94 g recorded the lowest dry leaf. Cultivars varied over the first and second years of production years [22]. Another study [15] found that because of the clover plant's exceptionally rapid regeneration, cultivars with a tendency of frequent cutting are likely to have problems curing for hay. Generally, the dry matter content of forage mass taken during the early vegetative stage is often lower [23.[

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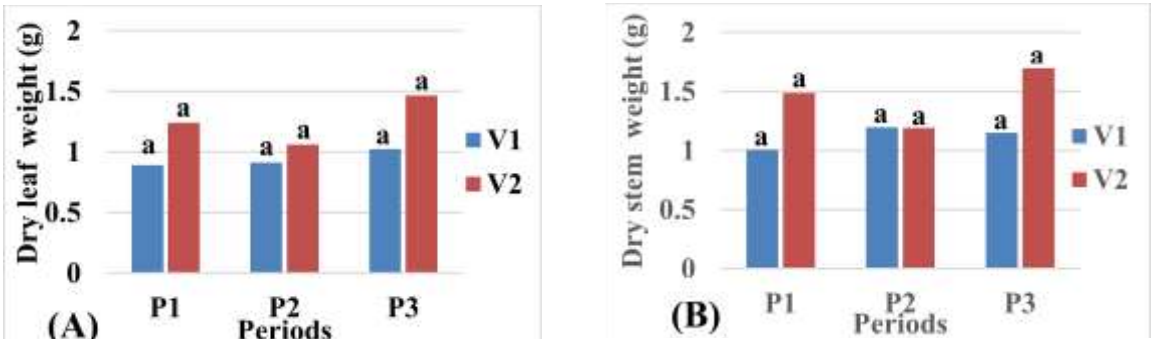

Figure 3. The effects of varieties and periods on (A) dry leaf and (B) dry stem weight (g). Bars with different letters show a significance level of ≤ 0.05 between means.

Effects of cutting times, periods and varieties on dry stem weight (g(

Table 1. showed that cutting times alone had a substantial impact on the dry stem weight (g), and interaction treatments did not significantly affect the dry stem weight (g). C2 1.24 g and C1(0.51g) recorded the highest and lowest value dry stem weight respectively. Figure (3B) shows that the interaction treatments (periods and varieties) do not significantly affect the dry stem weight. Only varieties alone are significantly affected by the dry stem weight. V2 recorded the highest (1.45 g) and the lowest dry stem weight recorded by V1(1.11 g) dry stem weight (g). Iannucci [12] found that all cultivars' dry matter accumulation was significantly impacted by the developmental stage at the cut .

Effects of cutting times, periods and varieties on leaf/stem ratio .

Table 1. data demonstrated that the cutting times had a substantial impact on the leaf/stem ratio. C2 recorded a height of 0.85, while C1 recorded the lowest ratio of 0.74. However, the leaf/stem ratio is not greatly impacted by variations by themselves or by the combination of varieties and cutting frequency. However, the leaf/stem ratio had no discernible effect on varieties or periods alone. Additionally, the leaf/stem ratio is not substantially impacted by the interaction between varieties and periods. Figure 4 shows that. These findings are dissimilar[11] the local variation generated the significantly greatest leaf/stem ratio in comparison to the other kinds according to a comparison of the average leaf/stem ratios of the other varieties .

These findings are a disparity with those made by [24]. Iannucci [12] reported that cutting had on the growth dynamics of two different genotypes of clover, defoliation resulted in a reduction in crown and root DM yield and a rise in leaf stem ratio [11]. These findings concur with those of [25] [21] who showed the highest fresh leaf/stem ratio (60.80), followed by (58.63), in the clover study. These differences were found to be very significant. In both cuts, the third stage of plant development was when the DM ratio was lowest. This is due to NDF's difficulty in digestion compared to forage's non-fiber

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components, which results in a lower leaf- stem ratio .

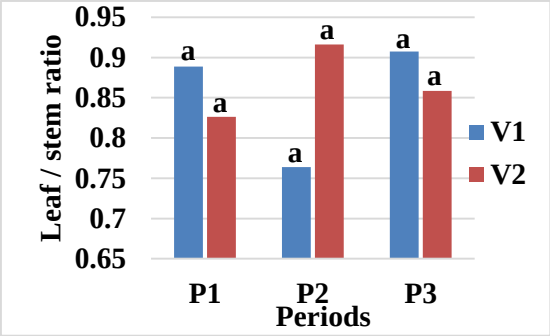

Figure 4. The effects of varieties and periods on leaf/ stem ratio. Bars with different letters show a significance level of ≤ 0.05 between means.

Effects of cutting times, periods and varieties on total fresh yield

Table 1 shows the outcomes of varieties and cutting times only result of cutting frequency alone were significantly total fresh yield ton/ha C2 recorded highest value 0.24. Based on Figure (5A) data, there was no significant difference found in the interaction between treatments and VP. total fresh yield ton/ha. Only varieties alone were significantly V2 recorded the maximum value of 0.29. The overall fresh yield ton/ha for V1 0.22 had the lowest value. The findings of this investigation were consistent with [6] who found that there were significant genetic variations for fresh forage yield. [17] showed that ten distinct features in clover were assessed to increase yields .

By choosing the best genotypes, it is possible to have a lot of genetic variation between genotypes regarding the degree of improvement. These results agree with [26] who assessed twelve potential populations and reported the maximum fresh yield overall. The outcomes that Bakheit [27] described are consistent with our findings. These findings contradict those of [28]. The characteristics of fresh forage yield vary greatly. The genotypic variance compared to the phenotypic variance for every variable indicated a limited impact from the environment[6 .[

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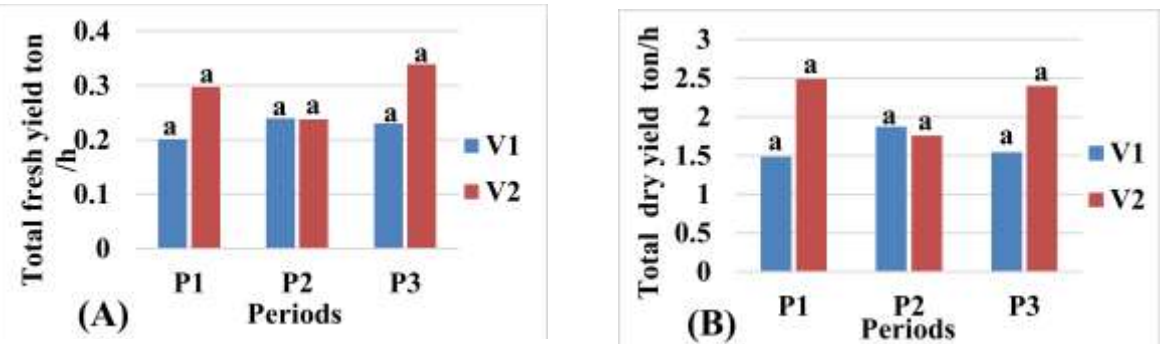

Figure 5. The effects of varieties and periods on (A) total fresh and (B) total dry yield (ton/h). Bars with different letters show a significance level of ≤ 0.05 between means .

Effects of cutting times, periods and varieties on total dry yield

Table 1 demonstrated that the outcomes of interaction variety and cutting times showed non-significant differences in total dry yield ton/ha. While variety and cutting frequency alone significantly affected total dry yield ton/ha. V2 recorded the highest value 1.90 also C2 1.98. The results of Figure (5B) showed that interactions variety and periods were non-significant different in total dry yield ton/ha. Only variety alone significantly difference V2 recorded the highest value (2.21) lowest value was recorded by V1(1.63 .(

These findings are consistent with those of [26] who found that the genotype Khadrawy had the highest overall dry yield. Additionally, according to other studies, there is a negative correlation between the growth stage at cutting and the DM yield in the regrowth, meaning that as the plants matured during primary growth, the DM yield in the regrowth dropped [11]. While there were no variations between the first and second cuts' dry yields, there were extremely significant differences between the third, fourth, fifth, and total cuts' dry yields. Coulman and Kielly [22] reported that cutting management did not have major effects on the yield and persistence of clover in experiments. first production year .

The three-cut approach would likely have produced more than the two-cut if yields in experiments were represented on a basis of digestible dry matter. The number of cuts did not impact the yields of the second producing year. according to Iannucci [12] delaying the first cut until the early stages of blooming led to a subsequent decline in DM yield of the herbage. The current study provides quantitative evidence demonstrating that cutting clover at the sixth internode elongation is superior to cutting at the early flower in terms of growth, herbage DM yield, and forage quality. Iannucci [12] reported that cutting had on the growth dynamics of two different genotypes of clover, defoliation resulted in a reduction in crown and root DM yield and a rise in leaf stem ratio. Pulli [29] showed that the process of creating total yields reveals that the 2 cut system saw the greatest rise in total yields due to the delay, while the 4cut method saw the least increase. The yield

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distribution per cut was higher at the later cutting date. Iannucci [12] shows that variations in DM partitioning of clover were most significantly impacted by cutting procedure and stage at cutting.

Conclusion

Based on the overall findings the growth parameters and yield (number of leaves per plant greatly impacted by variety, cutting times, and how they interact, furthermore plant height is not significantly influenced by cutting times, varieties, and their interactions while having a major impact on fresh weight, dry weight, fresh yield, and dry yield cutting times and variety alone had an impact, however, the relationship between cutting times and variety was not substantially affected .

Nevertheless, leaf/stem ratio alone significantly influenced by cutting times, but had no effect on varieties and the relationship between cutting times, varieties. However, plant height is significantly influenced by periods and their interaction with varieties, periods, while the number of leaves per plant, fresh weight, dry weight, fresh yield, and dry yield only varieties significantly influenced non significantly influenced by periods and their interaction. For optimal clover production, it is recommended to use a 36-day cutting period 3 for planting various clover varieties, as this period promotes the highest plant height. Additionally, the C2 variety demonstrates the highest yield and leaf/stem ratio, making it particularly suitable for silage .

Conflicts of Interest
The authors declare no conflict of interest .

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