# EFFECT OF DIFFERENT CLIPPING TIMES AND NITROGEN FERTILIZER ON FORAGE YIELDS AND ITS COMPONENTS OF TWO SIX – ROWED BARLEY VARIETIES AT TWO LOCATIONS OF SULAIMANI REGION

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**Abstract**

The availability of green forage to the livestock is one of the most important problems, especially in winters. The aim of this study was to determine the effect of different clipping times and nitrogen fertilizer on forage yields and its components of two six- rowed barley varieties at two locations of sulaimani region. The experiments were conducted in two different locations, the first was at College of Agricultural Sciences-University of Sulaimani located (Latitude: 35˚ 33′; N, Longitude 45˚ 27′; E, at altitude of approximately 830 m), and the second at Bazian location, which is situated 22.8 Km Southwestern of Sulaimani city with 814 m altidute above sea level during the winter season of 2014-2015 by using RCB design with split split plot arrangement with 3 replications. Two levels of nitrogen (40 and 80 kg/ha) as the main factor and two varieties of Barley (Ibba-99 and Local) as sub plots and four clipping times (no clip, clip 1, clip 2, and clip 3) as sub sub-plots were investigated. Means comparison were carried out using least significant difference test (LSD) at 0.05 significant levels. The results indicated that the forage yield and forage yield components of barley were significantly affected by nitrogen fertilizer, varieties and clipping time's treatment, and the interactions between treatments also significant for most traits at bakrajo and bazian location. The treatment of 80 kg N/ha fertilizer gave the highest forage yield and forage yield components but for dry matter percent the effect was not significant. Ibba-99 variety performance was better than Local variety in most forage yield and its components. The treatment of third clipping time outyielded the first and second clipping times due to all fresh, dry forage yield, dry matter percent and most forage yield components, and concerning leaves/stem ratio the second clipping time gave the highest ratio. Regarding the interaction between the treatments, N2 (N80 kg/ha) fertilizer with Ibb-99 variety and third clipping time recorded maximum value, while N1 (N40kg/ha) fertilizer with local variety and first clipping time gave minimum value of most traits.

**Keywords:** Barley; Clipping times; Nitrogen fertilizer; Varieties; Forage yield , Forage yield components; Dry matter%.

## تأثير مواعيد حش مختلفة و السماد النايتروجيني على حاصل العلف و مكوناته لصنفين من الشعير ذو ست صفوف لموقعين مختلفين في منطقة السليمانية

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**الخلاصة**

تعد توفر الأعلاف الخضراء للماشية من أهم المشاكل خاصةً في الشتاء ، و عليه تهدف هذه الدراسة تحديد تأثير مواعيد الحشات المختلفة مع الأسمدة النايتروجينية على حاصل العلف ومكوناته لنوعين من الشعير ذو ستة صفوف في موقعين مختلفين من منطقة السليمانية. حيث أجريت التجربة فى موقعين المختلفين ,الأولى في بكرجو (كلية العلوم الزراعية - جامعة السليمانية (خط العرض: 35˚ 33'، شمالا، خط الطول 45˚ 27'؛ شرقاً، على ارتفاع حوالي 830 م) ، و االثانية كانت في موقع بازيان اللتى وقعت 22,8 كم جنوب شرق مدينه السليمانيه و بخط عرض 814 م فوق سطح البحر خلال الموسم الشتوي (2014-2015) ، وبأستخدام نظام قطاعات المنشقه وفق تصميم القطاعات العشوائية الكاملة (RCBD)و بـثلاث مكررات. حيث وضع السماد النايتروجينى (40 و 80 كغ / هكتار) فى القطع الرأيسية و صنفين من الشعير (إيبا-99 و لوكال(المحلي)) في القطع المنشقة و مواعد حش مختلفة (بدون حش، موعد حش اللأول، موعد حش الثاني و موعد حش الثالث) في قطع منشقة مرتين . و تم إجراء المقارنة باستخدام اختبار أقل فرق معنوي (LSD) و بمستوى معنوية (0.05). دلت النتائج إلى أن حاصل العلف للشعير ومكوناته تأثرت بالأسمدة النايتروجينيةوالأصناف ومواعيد الحشات ، والتداخل بين المعاملات أيضاً تكون معنويه لمعظم الصفات في موقع البكرجو والبازيان. استخدام 80كغ/هكتارأعطت أعلى حاصل للعلف ومكوناته في معظم الصفات ولكن تأثيرها على نسبه الماده الجافه تكون غيرمعنويه, و أداء صنف اباء-99تكون أفضل من صنف المحلي في معظم الصفات, وموعد الحشة الثالثة تفوق معنوياً على الحشة الأولى و الثانية في حاصل العلف الأخضر ، حاصل العلف الجاف و مكونات حاصل العلف ونسبه الماده الجافه, بينما أعطت نسبة الأوراق / السيقان في الحشة الثانية أعلى نسبة . وبالنسبه للتداخل بين المعاملات ,التداخل بين السماد النايتروجيني (80كغم / هكتار)مع الصنف إبا-99 والحشة الثالثة سجلت أعلى قيمة. بينما أظهرت السماد النايتروجيني (40كغم / هكتار)مع الصنف المحلي و الحشة الأولى أقل قيمة في معظم الصفات وفي موقعين البكرجووالبازيان.

الكلمات المفتاحية: الشعير , مواعد الحش , السماد النتروجيني , اللأصناف , حاصل العلف , مكونات حاصل العلف , نسبة المادة الجافة.

## Introduction

In winter season the forage availability for livestock reduces very much, thus the farmers and other livestock owners feel great problem for feeding livestock so barley is mainly used to provide good quality forage during this reduced availability of forage. *Hordeum vulgare* L. (barley) belongs to Family Poaceae and is an annual plant with culm up to 70 cm hight; leaf-blade 5-16 cm long, 4-8 mm wide and sometimes sparsely hairy. Rachis are tough and not breaking up at maturity. Barley was one of the most important food crops during the ancient world and is mentioned in the Holy Quran and in the Bible. Today its major utility as food crop has reduced but it is still used as fodder crop throughout the world (1). Forage cereals play an important role in many grazing enterprises by helping to overcome winter feed shortages. They have higher winter growth rates than most pastures, and with their higher carrying capacity are able to ease the grazing pressure on pasture paddocks (2). Barley (*Hordeum vulgare L.*) is the major cereal in many dry areas of the world and is vital for the livelihoods of many farmers. Barley is an annual cereal crop and grown in environments ranging from the desert of the Middle East to the high elevation of Himalayas (3). Excess nitrogen increased leaf area, tiller formation, leaf area index and leaf area duration and this increasing is led to much greater production of dry matter and grain yield (4). Sylvester *et al*. (5) reported that plant height of cereals increased significantly and linearly with increased nitrogen application. in an experiment on the effects of nitrogen on barley cultivars concluded the biomass-related trait of leaf area was also increased by the application of N fertilizer. Also, percent increase in lodging incidence over the unfertilized treatment was assessed (6).

In an experiment on barley stated as expected, the main factors N and variety were significantly affected either on the yield parameters, but the interactions were less consistent. The amount of nitrogen that a barley crop needs to maximize yield and quality will depend on the seasonal conditions, soil type, and rotational history of the soil as well as the potential yield of the crop, and nitrogen is needed for early tiller development of barley to set up the crop for a high yield potential (7). Mohamed (8), reported that the dry matter yield of several varieties of cereals, increased significantly when harvest delayed

from the booting to the grain milk stage. There is a strong relationship between morphological structure and nutritional qualities of forage crops. An important factor affecting the quality and yield of forage is the growth stage of the plant harvest (9). Dry matter yield increases when the growth period before harvest extends, while certain important nutritional characteristics, such as crude protein and digestibility decreases (10). Annual forages can be used for many purposes in cropping and livestock systems. This article focuses on forage yield of unconventional annual forages and their potential for extending the livestock grazing season. Winter cereals offer good yields and good quality forage options for livestock grazing (11). Annual cereal forages produce one cutting and typically result in a high biomass yield of hay suitable for feeding many types of livestock (12). For forage crops, it is important to produce greater forage yields per hectare, higher nutritional quality (percentage composition of selected nutrients) or combined nutrient yields. High forage yield is very important for producers but for livestock enterprises, it is also important to produce high quality forages (8).

Arzadun *et al., (*13) observed in winter wheat that 3cm clipping height yielded 21% more forage than clipping at 7 cm height. Khalil *et al.,* (14) studied wheat as dual-purpose crop under different seed rates and nitrogen (N) levels and found that grain yield decreased with delayed in clipping, while no cutting produced tallest plants with highest grain yield, tiller. plant$^{-1}$, number of grains. spike$^{-1}$ and 1000 seed weight.

The objectives of this investigation were to determine the effect of different clipping times and nitrogen fertilizer on forage yields and its components of two six- rowed barley varieties at two locations of sulaimani region.

## Materials and Methods

An experiment was conducted on the basis of split split plot layout with randomized complete block design (RCBD) with 3 replications. Main plots were two levels of nitrogen fertilizer 40 and 80 Kg N ha$^{-1}$) from urea source, sub plots were two Barley varieties (Ibba-99 and Local), and sub sub plots were different clipping times {No Clip (C0), Clip 80 days after sowing (Clip1), Clip 105 days after sowing (Clip2) and Clip 130 days after sowing (Clip3)} dated February 4 , March 1 and March 25 respectively. This research was conducted during the winter season of 2014- 2015 year at two locations of Sulaimani region, first was at Bacrajo {(College of Agricultural Sciences-University of Sulaimani located (Latitude: 35˚ 33′; N, Longitude 45˚ 27′; E, at altitude of approximately 830 m)} and the second was at Bazian location, which is situated 22.8 Km Southwestern of Sulaimani city with 814 m altidute above sea level to study the effect of different clipping times and nitrogen fertilizer on forage yields of two six- rowed barley varieties at two locations of sulaimani region. The area of the experiment was 148.75 m$^2$, each replication consists of two main plots, and each main plot containing two sub plots, also each sub plots consist of two sub-sub plots having 4 lines, 2m long and 0.25m apart between rows was used. Sowing was conducted during Nov.15, 16 of 2014 at Bazian an Bakrajo location respectively according to the recommended seed rates 40Kg/donum for two used varieties, Phosphorus at the rate of 20 kg $P_2O_5$ ha$^{-1}$ was applied as triple super phosphate as a basal dose. All other input and agronomic practices was carried out uniformly. Nitrogen as urea (46.6% N) was applied at the above mentioned levels by two doses, first dose at sowing seeds and the second dose after 30 days of sowing. Other normal agronomic practices for barley production were followed. Forage clipping were conducted at the height (6-8cm) from the soil surface to determine:

Forage yield traits:

- Fresh forage and dry forage yield (ton/ha) and dry matter percent.

At harvest, fresh (green) forage weight was determined. The sub samples were taken

(and weighted) to put it in the oven at 65 C° for 72 hours to determine dry matter percent. Forage dry matter yield was recorded and converted in to dry matter production by using following formula [14].

Dry yield (Kg/ha) = Dry yield in cut plot/ Plot area * 10000

Forage yield components traits:

- Plant height (cm), number of leaves/plant, fresh weight of leaves/plant, dry weight of leaves/plant, fresh weight of stems/ plant, dry weight of stems/ plant and leaves/stem ratio.

For recording plant height, 5 plants were randomly selected in each plots, and the height was measured from the ground level to the apex of main stem, The number of leaves/plant was determined on the same five plants and weighted to record fresh weight of leaves and then dried in oven at 65 C° for 72 hours to determine dry weight of leaves; also the same things for stems, leaves/stem ratio was recorded by:

Weight of leaves/ weight of stems.

All data are presented as mean values of three replicates. The data were statistically analyzed according to the methods of analysis of variance as a general test and combined analysis conducted. The significance of differences among means was compared by using Least Significant Difference (LSD) test at significant level of 0.05 [15].

## Results and Discussion

- **Effect of varieties on forage yield and dry matter percent of Barley.**

Data represented in table 1 explain the effect of varieties on forage yield and dry matter percent, which was found to be significant for all traits at both locations with the exception of the characters dry forage yield and dry matter percent were not significant at bazian location, Ibba-99 variety recorded maximum values of fresh forage yield (20.382 and 7.179) ton/ha at bakrajo and bazian location respectively in compare to local variety which was recorded minimum values (14.525 and 5.350) ton/ha at both location respectively. Also ibba-99 variety gave maximum dry forage yield (2.739) ton/ha in bakrajo location, while local variety recorded minimum value of dry forage yield with (2.237) ton/ha in this location. Regarding dry matter percent, maximum dry matter percent (16.381) exhibited by Local variety at bakrajo location. The differences between two varieties in forage yield may be positively and strongly related to the time between sowing and cutting. These results were in agreement with the results reported by (16).

**Table 1:** Effect of varieties on forage yields and dry matter percent of barley at both locations.

| Varieties | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|
| **BAKRAJO** | | | |
| **Ibba-99** | 20.382 | 2.739 | 15.994 |
| **Local** | 14.525 | 2.237 | 16.381 |
| **LSD (0.05)** | 0.518 | 0.305 | 0.077 |
| **BAZIAN** | | | |
| **Ibba-99** | 7.179 | 1.634 | 20.703 |
| **Local** | 5.350 | 1.499 | 20.771 |
| **LSD (0.05)** | 0.183 | N.S | N.S |

**N.S: Not Significant**

- **Effect of nitrogen fertilizer on forage yield and dry matter percent of barley.**

Results of table 2 showed that the effect of nitrogen fertilization on forage yield and dry matter percent was significant for the characters Fresh forage yield and Dry forage yield at bakrajo and bazian location with the exception of the character dry forage in bakrajo location was not significant. The highest value of fresh forage yield and dry forage yield exhibited by $N_2$ (80 kg N/ha) in both locations with the exception of the character fresh forage yield in bakrajo location, $N_1$ (40 kgN/ha) gave maximum value (18.225) kg/ha. But the effect on dry matter percent was not significant at both locations.

**Table 2**: Effect of nitrogen fertilizer on forage yields and dry matter percent of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|
| **BAKRAJO** | | | |
| **N1 (40)** | 18.225 | 2.280 | 16.089 |
| **N2 (80)** | 16.683 | 2.695 | 16.286 |
| **LSD(0.05)** | 1.219 | N.S | N.S |
| **BAZIAN** | | | |
| **N1 (40)** | 5.278 | 1.159 | 20.874 |
| **N2 (80)** | 7.250 | 1.974 | 20.600 |
| **LSD(0.05)** | 1.096 | 0.247 | N.S |

**N.S: Not Significant**

- **Effect of clipping times on forage yield and dry matter percent of barley:**

Data in table 3 confirm out-yielding the third clipping time for all characters due to fresh, dry forage yield and dry matter percent at bakrajo and bazian location. The third clip predominated first and second clip in the characters fresh forage yield, dry forage yield and dry matter percent with (37.580 ton/ha, 5.237ton/ha and 16.945%) at bakrajo location respectively, and in bazian location with the values (16.837ton/ha, 4.274ton/ha and 21.410%) respectively, while the first clip treatment gave minimum values with (3.624 ton/ha, 0.483 ton/ha and 15.798%) at bakrajo and in bazian location with 0.581ton//ha, 0.115ton/ha and 19.917% for fresh, dry forage yield and dry matter percent respectively. Forage yield increased as clipping times delayed across growing season as the crop mature. These results agreed with the previous result who found that highly significant differences were observed in forage yield due to date of harvest and genotype (17). Also Shahzad K. *et al*, (9) reported that an important factor affecting the quality and yield of forage is the growth stage of the plant harvest.

**Table 3:** Effect of clipping times on forage yield and dry matter percent of barley at both locations.

| Clipping Times | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|
| **BAKRAJO** | | | |
| **Clip1 (4/2)** | 3.624 | 0.483 | 15.798 |
| **Clip2 (1/3)** | 11.158 | 1.743 | 15.820 |
| **Clip3 (25/3)** | 37.580 | 5.237 | 16.945 |
| **LSD (0.05)** | 0.514 | 0.414 | 0.448 |
| **BAZIAN** | | | |
| **Clip1 (4/2)** | 0.581 | 0.115 | 19.917 |
| **Clip2 (1/3)** | 1.376 | 0.311 | 20.884 |
| **Clip3 (25/3)** | 16.837 | 4.274 | 21.410 |
| **LSD (0.05)** | 0.360 | 0.200 | 0.457 |

**N.S: Not Significant**

- **Effect of varieties on forage yield components traits of barley.**

Data in table 4 showed the effect of varieties on forage yield components traits which were not significant for all traits with the exception of the traits fresh weight of leaves/plant, Dry weight of stems/plant and Leaves/Stem ratio which was found to be significant in bakrajo location, Ibba-99 variety recorded maximum value for the trait Fresh weight of leaves/plant was 4.409gm, while local variety gave maximum values of Dry weight of stems/plant and Leaves/Stem ratio were 0.815gm and 1.127 respectively at Bakrajo location. But in bazian location, the effect of varieties on all traits was significant with the exception of the characters no. of leaves/plant and fresh weight of leaves/plant which was found to be not significant, maximum values of the traits (plant height, dry weight of leaves/plant, fresh weight of stems/plant and dry weight of stems/plant) recorded by Ibba-99 variety were (40.236 cm, 0.663gm, 3.544gm and 0.758gm), while local variety gave the highest leaves/ stem ratio (1.303). The differences between two varieties may be due to their differences in relative performance of each genotype. This result was agreed with the results of (16).

- **Effect of nitrogen fertilizer on forage yield components traits of Barley.**

Data represented in table 5 showed the effect of nitrogen fertilizer on forage yield components traits of barley which was found to be not significant for all traits at Bakrajo location with the exception of the character dry weight of stems/plant and leaves/stem ratio which was found to be significant, and $N_2$ (80kgN/ha) treatment showed the highest values (0.833gm and 1.145) of dry weight of stems/plant and leaves/stem ratio respectively, concerning Bazian location, the effect was significant for all traits with the exception of the character no. of leaves/plant and fresh weight of leaves/plant which was found to be not significant, nitrogen fertilizer (N80) gave maximum values with (41.258 cm, 0.642gm, 3.812gm and 0.811gm) for the traits (plant height, dry weight of leaves/plant, fresh weight of stems/plant and dry weight of stems/plant) respectively, but nitrogen fertilizer (N40) gave maximum leaves/stem ratio with the value (1.296) in Bazian location. This increase of plant height and other traits

may be due to that the nitrogen is a building block of amino acids and protein in plants, chlorophyll is the most abundant protein in plant, it is involved in photosynthesis and increasing vegetative growth (18). Previously Sylvester *et al.* (5) reported that plant height of cereals increased significantly and linearly with increased nitrogen application.

**Table 4:** Effect of varieties on forage yield components of barley at both locations.

| Varieties | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant(gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/Stem ratio |
|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | |
| **Ibba-99** | 52.433 | 15.254 | 4.409 | 0.896 | 6.038 | 0.777 | 1.064 |
| **Local** | 51.364 | 16.187 | 3.676 | 0.842 | 5.819 | 0.815 | 1.127 |
| **LSD (0.05)** | N.S | N.S | 0.633 | N.S | N.S | 0.011 | 0.010 |
| **BAZIAN** | | | | | | | |
| **Ibba-99** | 40.236 | 13.743 | 2.603 | 0.663 | 3.544 | 0.758 | 1.246 |
| **Local** | 36.843 | 12.989 | 2.570 | 0.507 | 2.868 | 0.623 | 1.303 |
| **LSD(0.05)** | 1.138 | N.S | N.S | 0.062 | 0.387 | 0.038 | 0.025 |

**N.S: Not Significant**

**Table 5:** Effect of nitrogen fertilizer on forage yield components of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant (gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/Stem ratio |
|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | |
| **N1 (40)** | 51.068 | 16.128 | 3.762 | 0.932 | 5.489 | 0.758 | 1.045 |
| **N2 (80)** | 52.729 | 15.313 | 4.323 | 0.806 | 6.367 | 0.833 | 1.145 |
| **LSD (0.05)** | N.S | N.S | N.S | N.S | N.S | 0.008 | 0.017 |
| **BAZIAN** | | | | | | | |
| **N1 (40)** | 35.821 | 13.469 | 2.423 | 0.528 | 2.601 | 0.571 | 1.296 |
| **N2 (80)** | 41.258 | 13.263 | 2.750 | 0.642 | 3.812 | 0.811 | 1.253 |
| **LSD(0.05)** | 1.146 | N.S | N.S | 0.086 | 1.149 | 0.055 | 0.037 |

**N.S: Not Significant**

- **Effect of clipping times on forage yield components of Barley.**

The results of table 6 confirmed that the effect of clipping times on all forage yield component traits was significant at Bakrajo and Bazian location. Third clipping time exhibited maximum values for all traits (Plant height, Fresh weight of leaves/plant, Dry weight of leaves/plant, Fresh weight of stems/plant, and Dry weight of stems/plant) were (89.169cm, 6.329gm, 1.539gm, 12.781gm and 1.877gm) respectively at Bakrajo location, but the second clipping time gave maximum no. of leaves/plant (16.862), and also in Bazian location, the third clipping time gave maximum values for these traits (Plant height, No. of leaves/plant, Fresh weight of leaves/plant, Dry weight of leaves/plant, Fresh weight of stems/plant, and Dry weight of stems/plant) were (74.429cm, 16.885, 4.880gm, 1.241gm, 8.188gm and 1.835gm) respectively. While the first clipping time gave minimum values were (26.592cm, 13.525, 1.517gm, 0.291gm, 1.543gm and 0.190gm) at bakrajo and (16.167cm, 8.800, 0.618gm, 0.158gm, 0.298gm and 0.093gm) at bazian location for these traits (Plant height, No. of Leaves/plant, Fresh weight of leaves/plant, Dry weight of leaves/plant, Fresh weight of stems/plant, and Dry weight of stems/plant) respectively. But regarding the character leaves/stem ratio, Second clipping time exceeded the other treatment significantly and gave maximum ratio with (1.393 and 1.923) at bakrajo and bazian location respectively, in which minimum ratio of leaves/stem recorded by third clipping time (0.556and 0.619) for both location respectively. These maximum values for must characters due to the delay of clipping time, these results were in agreement with the results of (19).

**Table 6:** Effect of clipping times on forage yield components of barley at both locations.

| Clipping Times | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant (gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/Stem ratio |
|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | |
| **Clip1 (4/2)** | 26.592 | 13.525 | 1.517 | 0.291 | 1.543 | 0.190 | 1.337 |
| **Clip2 (1/3)** | 39.936 | 16.862 | 4.282 | 0.776 | 3.462 | 0.321 | 1.393 |
| **Clip3 (25/3)** | 89.169 | 16.776 | 6.329 | 1.539 | 12.781 | 1.877 | 0.556 |
| **LSD (0.05)** | 2.029 | 0.872 | 0.631 | 0.112 | 0.687 | 0.016 | 0.017 |
| **BAZIAN** | | | | | | | |
| **Clip1 (4/2)** | 16.167 | 8.800 | 0.618 | 0.158 | 0.298 | 0.093 | 1.281 |
| **Clip2 (1/3)** | 25.023 | 14.413 | 2.262 | 0.355 | 1.133 | 0.143 | 1.923 |
| **Clip3 (25/3)** | 74.429 | 16.885 | 4.880 | 1.241 | 8.188 | 1.835 | 0.619 |
| **LSD(0.05)** | 1.152 | 0.596 | 0.505 | 0.050 | 0.360 | 0.030 | 0.045 |

- **Effect of interaction between nitrogen fertilizer and varieties on forage yields and dry matter percent of barley at both locations.**

Data in table 7 showed that the effect of interaction between nitrogen fertilizer and varieties on fresh forage yields at both locations and dry matter percent in bakrajo location only was significant, maximum fresh forage yield produced by the interaction between 40 kg N/ha and local variety at Bakrajo location were (22.417) ton/ha, while in Bazian location, the interaction between 80 kg N/ha and Ibba-99 variety gave the highest fresh forage yield (8.343) ton/ha. Regarding dry matter percent, the highest percent of dry matter (17.370%) recorded by the interaction between 80 kg N/ha and local variety in bakrajo location.

**Table 7:** Effect of interaction between nitrogen fertilizer and varieties on forage yields and dry matter percent of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Varieties | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|---|
| **BAKRAJO** | | | | |
| **N1 (40)** | **Ibba-99** | 22.417 | 2.436 | 16.786 |
| | **Local** | 14.033 | 2.125 | 15.392 |
| **N2 (80)** | **Ibba-99** | 18.347 | 3.041 | 15.202 |
| | **Local** | 15.018 | 2.348 | 17.370 |
| **LSD(0.05)** | | 0.733 | N.S | 0.109 |
| **BAZIAN** | | | | |
| **N1 (40)** | **Ibba-99** | 6.016 | 1.278 | 20.553 |
| | **Local** | 4.541 | 1.041 | 21.194 |
| **N2 (80)** | **Ibba-99** | 8.343 | 1.990 | 20.853 |
| | **Local** | 6.158 | 1.958 | 20.347 |
| **LSD(0.05)** | | 0.258 | N.S | N.S |

**N.S: Not Significant**

- **Effect of interaction between nitrogen fertilizer and clipping times on forage yields and dry matter percent of barley at both locations.**

Data represented in table 8 confirmed that the effect of interaction between nitrogen fertilizer and clipping times on forage yields and dry matter percent of barley was significant at both locations with the exception of dry matter percent in Bakrajo location only was found to be not significant. Maximum fresh forage yield exhibited by the interaction between 40 kg N/ha and the third clipping times were (40.349) ton/ha in Bakrajo location, while at Bazian location, maximum fresh forage yield (19.674) ton/ha produced by the interaction between 80 kg N/ha and the third clipping times, and also maximum yield of dry forage (5.898 and 5.359) ton/ha recorded by this interaction at both locations respectively. Concerning dry matter percent in Bakrajo location, the highest percent (21.602%) produced also by the interaction between 80 kg N/ha and the third clipping times.

**Table 8:** Effect of interaction between nitrogen fertilizer and clipping times on forage yields and dry matter percent of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Clipping Times | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|---|
| **BAKRAJO** | | | | |
| **N1 (40)** | **Clip1 (4/2)** | 3.608 | 0.505 | 15.487 |
| | **Clip2 (1/3)** | 10.719 | 1.759 | 15.917 |
| | **Clip3 (25/3)** | 40.349 | 4.577 | 16.863 |
| **N2 (80)** | **Clip1 (4/2)** | 3.640 | 0.461 | 16.108 |
| | **Clip2 (1/3)** | 11.597 | 1.726 | 15.723 |
| | **Clip3 (25/3)** | 34.810 | 5.898 | 17.027 |
| **LSD(0.05)** | | 0.727 | 0.585 | N.S |
| **BAZIAN** | | | | |
| **N1 (40)** | **Clip1 (4/2)** | 0.551 | 0.081 | 19.933 |
| | **Clip2 (1/3)** | 1.285 | 0.209 | 21.470 |
| | **Clip3 (25/3)** | 13.999 | 3.188 | 21.218 |
| **N2 (80)** | **Clip1 (4/2)** | 0.610 | 0.150 | 19.900 |
| | **Clip2 (1/3)** | 1.467 | 0.413 | 20.298 |
| | **Clip3 (25/3)** | 19.674 | 5.359 | 21.602 |
| **LSD(0.05)** | | 0.509 | 0.283 | 0.647 |

**N.S: Not Significant**

- **Effect of interaction between varieties and clipping times on forage yields and dry matter percent of barley at both locations.**

Data in table 9 showed the effect of interaction between varieties and clipping times on fresh forage yields and dry matter percent of barley at both locations was significant but on dry forage yield which was found to be not significant at both locations. The interaction between Ibba-99 variety and third clipping times gave maximum fresh forage yield and dry matter percent (44.071 ton/ha and 17.227%), (19.528 ton/ha and 21.758%) at Bakrajo and Bazian location respectively, while minimum value of fresh forage yield and dry matter percent (3.581 ton/ha and 15.475%) recorded by the interaction between Ibba-99 variety and first clipping times at Bakrajo location and (0.579 ton/ha and 19.430%) in bazian location respectively.

**Table 9:** Effect of interaction between varieties and clipping times on forage yields and dry matter percent of barley at both locations.

| Varieties | Clipping Times | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|---|
| **BAKRAJO** | | | | |
| **Ibba-99** | **Clip1 (4/2)** | 3.581 | 0.508 | 15.475 |
| | **Clip2 (1/3)** | 13.496 | 2.053 | 15.280 |
| | **Clip3 (25/3)** | 44.071 | 5.655 | 17.227 |
| **Local** | **Clip1 (4/2)** | 3.668 | 0.458 | 16.120 |
| | **Clip2 (1/3)** | 8.820 | 1.432 | 16.360 |
| | **Clip3 (25/3)** | 31.089 | 4.820 | 16.663 |
| **LSD(0.05)** | | 0.727 | N.S | 0.634 |
| **BAZIAN** | | | | |
| **Ibba-99** | **Clip1 (4/2)** | 0.579 | 0.127 | 19.430 |
| | **Clip2 (1/3)** | 1.431 | 0.368 | 20.922 |
| | **Clip3 (25/3)** | 19.528 | 4.407 | 21.758 |
| **Local** | **Clip1 (4/2)** | 0.582 | 0.103 | 20.403 |
| | **Clip2 (1/3)** | 1.321 | 0.254 | 20.847 |
| | **Clip3 (25/3)** | 14.146 | 4.140 | 21.062 |
| **LSD(0.05)** | | 0.509 | N.S | 0.647 |

N.S: Not Significant

- **Effect of interaction between nitrogen fertilizer, varieties and clipping times on forage yields and dry matter percent of barley at both locations.**

Table 10 represent the effect of interaction between nitrogen fertilizer, varieties and clipping times on forage yields and dry matter percent of barley at both locations which was found to be significant for fresh forage yield at both location and for dry forage yield and dry matter percent at Bakrajo location only but in Bazian location was found to be not significant. Maximum fresh forage yield and dry matter percent (50.001 ton/ha and 17.963%) recorded by the interaction between 40 kg N/ha, Ibba-99 variety and third clipping times in Bakrajo location, while maximum dry forage yield (6.694 ton/ha) in Bakrajo location and maximum yield of fresh forage (23.414 ton/ha) in Bazian location were obtained by the interaction between 80 kg N/ha, Ibba-99 variety and third clipping time.

**Table 10**: Effect of interaction between nitrogen fertilizer, varieties and clipping times on forage yields and dry matter percent of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Varieties | Clipping Times | Fresh forage yield (ton/ha) | Dry Forage yield (ton/ha) | % Dry matter |
|---|---|---|---|---|---|
| **BAKRAJO** | | | | | |
| **N1 (40)** | **Ibba-99** | **Clip1 (4/2)** | 3.354 | 0.454 | 16.397 |
| | | **Clip2 (1/3)** | 13.897 | 2.239 | 15.997 |
| | | **Clip3 (25/3)** | 50.001 | 4.615 | 17.963 |
| | **Local** | **Clip1 (4/2)** | 3.862 | 0.557 | 14.577 |
| | | **Clip2 (1/3)** | 7.541 | 1.279 | 15.837 |
| | | **Clip3 (25/3)** | 30.697 | 4.539 | 15.763 |
| **N2 (80)** | **Ibba-99** | **Clip1 (4/2)** | 3.807 | 0.563 | 14.553 |
| | | **Clip2 (1/3)** | 13.095 | 1.867 | 14.563 |
| | | **Clip3 (25/3)** | 38.140 | 6.694 | 16.490 |
| | **Local** | **Clip1 (4/2)** | 3.474 | 0.359 | 17.663 |
| | | **Clip2 (1/3)** | 10.099 | 1.585 | 16.883 |
| | | **Clip3 (25/3)** | 31.481 | 5.101 | 17.563 |
| **LSD(0.05)** | | | 1.028 | 0.827 | 0.897 |
| **BAZIAN** | | | | | |
| **N1 (40)** | **Ibba-99** | **Clip1 (4/2)** | 0.748 | 0.093 | 19.107 |
| | | **Clip2 (1/3)** | 1.658 | 0.259 | 20.993 |
| | | **Clip3 (25/3)** | 15.641 | 3.482 | 21.560 |
| | **Local** | **Clip1 (4/2)** | 0.354 | 0.068 | 20.760 |
| | | **Clip2 (1/3)** | 0.911 | 0.159 | 21.947 |
| | | **Clip3 (25/3)** | 12.357 | 2.895 | 20.877 |
| **N2 (80)** | **Ibba-99** | **Clip1 (4/2)** | 0.410 | 0.161 | 19.753 |
| | | **Clip2 (1/3)** | 1.204 | 0.477 | 20.850 |
| | | **Clip3 (25/3)** | 23.414 | 5.333 | 21.957 |
| | **Local** | **Clip1 (4/2)** | 0.810 | 0.139 | 20.047 |
| | | **Clip2 (1/3)** | 1.730 | 0.349 | 19.747 |
| | | **Clip3 (25/3)** | 15.935 | 5.385 | 21.247 |
| **LSD(0.05)** | | | 0.720 | N.S | N.S |

**N.S: Not Significant**

- **Effect of interaction between nitrogen fertilizer and varieties on forage yield components of barley at both locations**.

Data in table 11 confirmed that the effect of interaction between nitrogen fertilizer and varieties on forage yield components of barley was significant for all traits with the exception of the characters (fresh weight of leaves/plant and dry weight of leaves/plant) was not significant in Bakrajo location. The interaction between 80 kg N/ha and Ibba-99 variety gave the highest values (55.150 cm, 7.027 gm and 0.912gm) for the traits (plant height, fresh weight of stems/plant and dry weight of stems/plant) respectively, while maximum no. of leaves/plant (17.594) obtained by the interaction between 40 Kg N/ha and Local variety and maximum leaves/stem ratio (1.198) recorded by the interaction between 80 Kg N/ha and Local variety in Bakrajo location. Concerning Bazian location, the effect was not significant for most traits but for the characters

dry weight of leaves /plant, dry weight of stems/plant and leaves/stem ratio was found to be significant. Maximum dry weight of leaves/plant and dry weight of stems/plant exhibited by the interaction between 80 kg N/ha with Ibba-99 variety were (0.683 and 0.939) gm respectively, in which the highest value of leaves/stem ratio (1.357) was obtained by interaction between 40 kg N/ha and local variety.

**Table 11:** Effect of interaction between nitrogen fertilizer and varieties on forage yield components of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Varieties | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant (gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/Stem ratio |
|---|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | | |
| **N1 (40)** | **Ibba-99** | 49.717 | 14.662 | 4.189 | 0.937 | 5.049 | 0.641 | 1.035 |
| | **Local** | 52.420 | 17.594 | 3.336 | 0.927 | 5.930 | 0.876 | 1.055 |
| **N2 (80)** | **Ibba-99** | 55.150 | 15.847 | 4.629 | 0.854 | 7.027 | 0.912 | 1.093 |
| | **Local** | 50.309 | 14.780 | 4.017 | 0.757 | 5.708 | 0.754 | 1.198 |
| **LSD(0.05)** | | 2.054 | 1.913 | N.S | N.S | 1.377 | 0.015 | 0.015 |
| **BAZIAN** | | | | | | | | |
| **N1 (40)** | **Ibba-99** | 37.033 | 13.963 | 2.304 | 0.642 | 2.787 | 0.578 | 1.235 |
| | **Local** | 34.608 | 12.976 | 2.541 | 0.413 | 2.414 | 0.563 | 1.357 |
| **N2 (80)** | **Ibba-99** | 43.439 | 13.523 | 2.901 | 0.683 | 4.302 | 0.939 | 1.256 |
| | **Local** | 39.078 | 13.002 | 2.599 | 0.600 | 3.321 | 0.682 | 1.250 |
| **LSD(0.05)** | | N.S | N.S | N.S | 0.088 | N.S | 0.054 | 0.035 |

**N.S: Not Significant**

- **Effect of interaction between nitrogen fertilizer and clipping times on forage yield components of barley at both locations.**

Table 12 showed that the effect of interaction between nitrogen fertilizer and clipping times on forage yield components of barley was significant for all traits at both locations with the exception of the character fresh weight of leaves/plant in Bakrajo location and leaves/stem ratio at both locations which was found to be not significant. The interaction between nitrogen fertilizer $N_2$ (80 kg/ha) and third clipping time gave maximum value of most traits, while minimum value of most traits were recorded by the interaction between $N_1$ (40) with the first clipping time at both locations.

**Table 12:** Effect of interaction between nitrogen fertilizer and clipping times on forage yield components of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Clipping Times | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant (gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/ Stem ratio |
|---|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | | |
| **N1 (40)** | **Clip1 (4/2)** | 25.367 | 15.067 | 1.363 | 0.288 | 1.137 | 0.180 | 1.277 |
| | **Clip2 (1/3)** | 43.523 | 16.820 | 3.982 | 0.817 | 3.638 | 0.325 | 1.350 |
| | **Clip3 (25/3)** | 84.315 | 16.498 | 5.942 | 1.690 | 11.693 | 1.770 | 0.509 |
| **N2 (80)** | **Clip1 (4/2)** | 27.817 | 11.983 | 1.670 | 0.293 | 1.948 | 0.200 | 1.398 |
| | **Clip2 (1/3)** | 36.348 | 16.903 | 4.582 | 0.735 | 3.285 | 0.317 | 1.435 |
| | **Clip3 (25/3)** | 94.023 | 17.053 | 6.717 | 1.388 | 13.868 | 1.983 | 0.604 |
| **LSD(0.05)** | | 2.870 | 1.234 | N.S | 0.159 | 0.971 | 0.022 | N.S |
| **BAZIAN** | | | | | | | | |
| **N1 (40)** | **Clip1 (4/2)** | 14.833 | 7.917 | 0.795 | 0.170 | 0.263 | 0.097 | 1.288 |
| | **Clip2 (1/3)** | 23.245 | 15.330 | 2.385 | 0.317 | 0.925 | 0.148 | 1.943 |
| | **Clip3 (25/3)** | 69.383 | 17.162 | 4.088 | 1.097 | 6.613 | 1.467 | 0.657 |
| **N2 (80)** | **Clip1 (4/2)** | 17.500 | 9.683 | 0.440 | 0.147 | 0.333 | 0.090 | 1.275 |
| | **Clip2 (1/3)** | 26.800 | 13.497 | 2.138 | 0.393 | 1.340 | 0.138 | 1.904 |
| | **Clip3 (25/3)** | 79.475 | 16.608 | 5.672 | 1.385 | 9.762 | 2.203 | 0.581 |
| **LSD(0.05)** | | 1.630 | 0.842 | 0.714 | 0.071 | 0.510 | 0.043 | N.S |

**N.S: Not Significant**

- **Effect of interaction between varieties and clipping times on forage yield components of barley at both locations.**

Data represented in table 13 confirmed that the effect of interaction between varieties and clipping times on forage yield components traits of barley was significant on all traits at both locations with the exception of the character no. of leaves/plant, dry weight of leaves/plant at Bakrajo location ant plant height in Bazian location which was found to be not significant. The interaction between Local variety and third clipping times gave maximum values of all traits in Bkrajo location, while maximum leaves/stem ratio was obtained by the interaction between Local variety and second clipping time. Regarding Bazian location, the interaction between Ibba-99 and third clipping time gave maximum value of all traits, in which maximum

leaves/stem ratio was recorded by the interaction between Ibba-99 variety with the second clipping time.

**Table 13:** Effect of interaction between varieties and clipping times on forage yield components of barley at both locations.

| Varieties | Clipping Times | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant (gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/ Stem ratio |
|---|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | | |
| **Ibba-99** | **Clip1 (4/2)** | 26.600 | 13.267 | 1.767 | 0.278 | 1.667 | 0.223 | 1.269 |
| | **Clip2 (1/3)** | 42.492 | 16.775 | 5.262 | 0.857 | 4.278 | 0.383 | 1.335 |
| | **Clip3 (25/3)** | 88.208 | 15.722 | 6.198 | 1.552 | 12.168 | 1.723 | 0.588 |
| **Local** | **Clip1 (4/2)** | 26.583 | 13.783 | 1.267 | 0.303 | 1.418 | 0.157 | 1.405 |
| | **Clip2 (1/3)** | 37.380 | 16.948 | 3.302 | 0.695 | 2.645 | 0.258 | 1.450 |
| | **Clip3 (25/3)** | 90.130 | 17.830 | 6.460 | 1.527 | 13.393 | 2.030 | 0.524 |
| **LSD(0.05)** | | 2.870 | N.S | 0.892 | N.S | 0.971 | 0.022 | 0.024 |
| **BAZIAN** | | | | | | | | |
| **Ibba-99** | **Clip1 (4/2)** | 18.117 | 9.517 | 0.468 | 0.177 | 0.370 | 0.105 | 1.207 |
| | **Clip2 (1/3)** | 26.773 | 13.995 | 2.023 | 0.362 | 1.143 | 0.143 | 1.955 |
| | **Clip3 (25/3)** | 75.818 | 17.718 | 5.317 | 1.450 | 9.120 | 2.027 | 0.576 |
| **Local** | **Clip1 (4/2)** | 14.217 | 8.083 | 0.767 | 0.140 | 0.227 | 0.082 | 1.356 |
| | **Clip2 (1/3)** | 23.272 | 14.832 | 2.500 | 0.348 | 1.122 | 0.143 | 1.892 |
| | **Clip3 (25/3)** | 73.040 | 16.052 | 4.443 | 1.032 | 7.255 | 1.643 | 0.663 |
| **LSD(0.05)** | | N.S | 0.842 | 0.714 | 0.071 | 0.510 | 0.043 | 0.063 |

**N.S: Not Significant**

- **Effect of interaction between nitrogen fertilizer, varieties and clipping times on forage yield components of barley at both locations.**

Table 14 showed the effect of interaction between nitrogen fertilizer, varieties and clipping times on all forage yield components of barley was significant at both locations with the exception of the character no. of leaves/plant, dry weight of leaves/plant in Bakrajo location and fresh weight of leaves/plant in Bazian location which was

found to be not significant. The interaction between 80 kg N/ha, Ibba-99 variety and third clipping times gave maximum values of plant height and fresh weight of stems/plant were (97.573 cm and 14.500gm) respectively in Bakrajo location and also plant height, dry weight of leaves/plant, fresh weight of stems/plant and dry weight of stems/plant with (83.443cm, 1.510gm, 11.427gm and 2.560gm) respectively in Bazian location. Interaction between 80 kg N/ha, Local variety and third clipping time gave the highest value of fresh weight of leaves/plant (7.510gm) in Bakrajo location and the highest no. of leaves/plant (19.440) obtained by the interaction between 40 kg N/ha, Ibba-99 variety and third clipping time in Bazian location. Regarding leaves/stem ratio, maximum ratio (1.582) recorded by the interaction between 80 kg N/ha, Local variety and first clipping time in Bakrajo location, while in Bazian location the highest leaves/stem ratio(1.956) was obtained by the interaction between 40 kg N/ha, Ibba-99 variety and second clipping time.

**Table 14:** Effect of interaction between nitrogen fertilizer, varieties and clipping times on forage yield components of barley at both locations.

| Nitrogen Fertilizer level (kg/ha) | Varieties | Clipping Times | Plant height (cm) | No. of Leaves /plant | Fresh Weight of Leaves /plant (gm) | Dry Weight of Leaves /plant (gm) | Fresh Weight of Stems /plant (gm) | Dry Weight of Stems /plant (gm) | Leaves/ Stem ratio |
|---|---|---|---|---|---|---|---|---|---|
| **BAKRAJO** | | | | | | | | | |
| **N1 (40)** | **Ibba-99** | **Clip1 (4/2)** | 24.933 | 13.433 | 1.333 | 0.267 | 1.113 | 0.177 | 1.324 |
| | | **Clip2 (1/3)** | 45.373 | 16.220 | 4.760 | 0.863 | 4.197 | 0.357 | 1.256 |
| | | **Clip3 (25/3)** | 78.843 | 14.333 | 6.473 | 1.680 | 9.837 | 1.390 | 0.525 |
| | **Local** | **Clip1 (4/2)** | 25.800 | 16.700 | 1.393 | 0.310 | 1.160 | 0.183 | 1.229 |
| | | **Clip2 (1/3)** | 41.673 | 17.420 | 3.203 | 0.770 | 3.080 | 0.293 | 1.445 |
| | | **Clip3 (25/3)** | 89.787 | 18.663 | 5.410 | 1.700 | 13.550 | 2.150 | 0.492 |
| **N2 (80)** | **Ibba-99** | **Clip1 (4/2)** | 28.267 | 13.100 | 2.200 | 0.290 | 2.220 | 0.270 | 1.213 |
| | | **Clip2 (1/3)** | 39.610 | 17.330 | 5.763 | 0.850 | 4.360 | 0.410 | 1.414 |
| | | **Clip3 (25/3)** | 97.573 | 17.110 | 5.923 | 1.423 | 14.500 | 2.057 | 0.651 |
| | **Local** | **Clip1 (4/2)** | 27.367 | 10.867 | 1.140 | 0.297 | 1.677 | 0.130 | 1.582 |
| | | **Clip2 (1/3)** | 33.087 | 16.477 | 3.400 | 0.620 | 2.210 | 0.223 | 1.456 |
| | | **Clip3 (25/3)** | 90.473 | 16.997 | 7.510 | 1.353 | 13.237 | 1.910 | 0.556 |
| **LSD(0.05)** | | | 4.059 | N.S | 1.262 | N.S | 1.373 | 0.032 | 0.034 |
| **BAZIAN** | | | | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **N1 (40)** | **Ibba-99** | **Clip1 (4/2)** | 17.467 | 8.567 | 0.430 | 0.180 | 0.383 | 0.093 | 1.147 |
| | | **Clip2 (1/3)** | 25.440 | 13.883 | 2.203 | 0.357 | 1.163 | 0.147 | 1.956 |
| | | **Clip3 (25/3)** | 68.193 | 19.440 | 4.280 | 1.390 | 6.813 | 1.493 | 0.602 |
| | **Local** | **Clip1 (4/2)** | 12.200 | 7.267 | 1.160 | 0.160 | 0.143 | 0.100 | 1.428 |
| | | **Clip2 (1/3)** | 21.050 | 16.777 | 2.567 | 0.277 | 0.687 | 0.150 | 1.930 |
| | | **Clip3 (25/3)** | 70.573 | 14.883 | 3.897 | 0.803 | 6.413 | 1.440 | 0.713 |
| **N2 (80)** | **Ibba-99** | **Clip1 (4/2)** | 18.767 | 10.467 | 0.507 | 0.173 | 0.357 | 0.117 | 1.267 |
| | | **Clip2 (1/3)** | 28.107 | 14.107 | 1.843 | 0.367 | 1.123 | 0.140 | 1.953 |
| | | **Clip3 (25/3)** | 83.443 | 15.997 | 6.353 | 1.510 | 11.427 | 2.560 | 0.549 |
| | **Local** | **Clip1 (4/2)** | 16.233 | 8.900 | 0.373 | 0.120 | 0.310 | 0.063 | 1.283 |
| | | **Clip2 (1/3)** | 25.493 | 12.887 | 2.433 | 0.420 | 1.557 | 0.137 | 1.854 |
| | | **Clip3 (25/3)** | 75.507 | 17.220 | 4.990 | 1.260 | 8.097 | 1.847 | 0.613 |
| **LSD(0.05)** | | | 2.304 | 1.191 | N.S | 0.100 | 0.721 | 0.060 | 0.090 |

**N.S: Not Significant**

**Conclusion:**

From the results of this study, we concluded that forage yield and forage yield components of barley were significantly affected by nitrogen fertilizer, varieties and clipping time's treatment, and the interactions between treatments also significant for most traits at bakrajo and bazian location. The treatment of 80 kg N/ha fertilizer gave the highest forage yield and forage yield components but for dry matter percent the effect was not significant. Ibba-99 variety performance was better than Local variety in most forage yield and its components. The treatment of third clipping time outyielded the first and second clipping times due to all fresh, dry forage yield, dry matter percent and most forage yield components, and concerning leaves/stem ratio the second clipping time gave the highest ratio. Regarding the interaction between the treatments, $N_2$ (N80 kg/ha) fertilizer with Ibb-99 variety and third clipping time recorded maximum value, while $N_1$ (N40kg/ha) fertilizer with local variety and first clipping time gave minimum value of most traits. In general, the value of most traits at bakrajo location was higher than bazian location due to environmental condition.

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