



ESTIMATION OF DRY AND ORGANIC MATTER DIGESTIBILITY OF SPROUTED BARLEY AT DIFFERENT AGES LABORATORY

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Abstract. Current study conducted to estimate the differences of in vitro dry matter digestibility (IVDMD%) and in vitro organic matter digestibility (IVOMD%) of sprouted barley forage that planted at different period and harvested at two different maturity stages. Each treatment was randomly assigned to three replications. Results showed that in vitro dry matter digestibility (IVDMD) and organic matter digestibility (IVOMD) were higher in T1 comparing to T2. It was 77.41 and 78.46% while it was 66.11 and 66.64% in T2 respectively. In vitro levels of samples were showed to be lower in T2 than T1. Yield level of barley was significantly affected due to vegetation stage ($p < 0.01$). It concluding prolonged the vegetation stage had significantly decrease digestibility of dry matter and organic matter.

Keywords: digestibility, in vitro, dry matter, organic matter.

INTRODUCTION

Animals are very important source to produce food security in most countries of world that faced serious problems to offer the fodder that depend essentially on the climatic variations which including precipitation also seasonal [1]. Breeders try to search on alternative feed sources because of the lack of fodder, in addition to, high prices globally of fodder and decrease and waste of water source.

Sprouted barley consider as one way of produce of forages without needing the soil, it has a high fast-growing period and germination rate [2]. This technique has

a lot of benefit especially in regions that face water shortages and the seasonality of forages are common challenges for animal producers.

Roughage is very important for ruminants which promote maintaining fodder all year and still big challenge because of environment changing, solving this problem need improvement of pasture management and using alternative solutions like Hydroponic farming systems without soil and fertilizers to produce fresh green fodder in addition, more benefit through decrease the pollution associated from using the fertilizer [3]. Barley considers as a cold climate cereal which is widely planted in high number of places and adapted to gain its benefit in the world. As well as, barley product comes after wheat with both cultivation and production especially in Turkey [4]. Barley fodder is widely planted for its grain with the same time using as forage barley has high digestible of dry matter and organic matter yield. Its biggest harvest time is very important and to get these properties paying attention to its benefit for ruminant animals to enhance production. In addition, vegetation period of barley grains leading to very crucial variation in the quality of fodder [5]. The optimum quality of forage could be achieved by harvesting it at the seed stage or what we call the milk stage, on other hand harvesting the fodder in the dough level will provide the good quality forage in spite of less than another harvest periods comparatively [6]. The differences in harvesting time of barley leading to variation in the chemical compositions that causes more differences in the nutrients and digestibility also, when transcribe in invitro conditions all those differences are very important to the animal feeding [7], [8]. Hydroponically fodders consider is rich in minerals, enzymes vitamins and near 90 % of it is digestible protein. Ruther more, sprouting of grains leading to increase the sugars activity of enzymatic with decrease of starch [9].

The main benefit of these methods to support fresh roughage during all the year by germination of grains like wheat, barley and oats that provide a stable and important source of green fodder for animal.

MATERIALS AND METHODS

Two treatments were conducted with three replicates from each treatment the first treatment was 8 days while the second treatment was 15 days period of cultivated barley grains, first washing grains many times with water second filter it from strange objects after that cultivated it in tries with irrigate daily with lighting supporting .

In vitro dry matter digestibility (IVDMD) and in vitro organic matter digestibility (IVOMD) of sprouted barley was investigate by using the procedure that reported by Tilley and Terry and modified by Marten and Barnes.

Statistical Analysis

All data were statistically analyzed by using a Completely Randomized Design (CRD) with an Independent Samples test to estimate the differences between the two stages in the 8 and 15 days to all measured parameters. The analysis data was performed by using standard statistical functions, with the significance level set at $P < 0.01$.

RESULTS

Depending on the results that showed in the table 1 IVDMD of under eight days sprouted barley was higher compare to another treatment 15 days, it was 77.41 while it was 66.11 in the fifteen days of sprouted barley. Tables also showed there

is significant effect in IVOMD values which was 78.46 in first treatment comparing to fifteen days of sprouted barely where it was 66.64 .

Table 1: Value of in vitro dry matter and organic matter

Treatments	IDMD%	IOMD%
Treatments 1	77.41±0.76a	78.46±0.76a
Treatments 2	66.11±0.35b	66.64±0.33b

The means with different superscript letters (a and b) in the same row was significantly different ($P < 0.01$) [10].

In this research paper, it is noticed that IVDMD and IVOMD levels were higher in the earlier stage less than fifteen days which support the idea that the lignification of barley in this period was not occur sufficiently for decreasing the digestibility of DM and OM.

Thus, it can be conclude that the increase of ADF levels in barley lead to a decrease feeds digestibility, as well as, this increasing in a special level cause in an energy loss which depending on the amount of increasing of methane production [11].

Hervas et al. 2004 showed that IVDMD of barley forage was 61.7% while it was 66.4% [12], [13]. IVDMD levels obtained by Kowalski et al. 2014 was 72.6%. In different study conducted by Akbag et al. 2014 the IVOMD of barley forage that harvested with three different maturities ranged from 63.93% to 73.57% and all these values are similar to those obtained in the research paper.

The decrease in IVOMD with progressing vegetation refer to the variation in the energy forage content. It is showed that the NEL and ME levels of barley forage were 6.5 MJ/kg DM and 9.8 MJ/kg DM respectively [14]. It is noticed that the DM and OM growth per unit area was differ around 2.5 times because the first and last harvested period. This variation may be due to ecologic conditions that effect on harvest stage like precipitation and heat, thus, the soil features and climate make significant influences on the yield properties in plant [15], [16].

As the dry matter with organic matter yields in vitro digestible are calculating by multiplying the digestibility % of dry matter and organic matter (%) in vitro values and dry matter and organic matter growth per unit area, it is noticed that it is parallel to dry matter and organic matter yields obtained per unit area. Also, it is showed that ADF levels of fodder are related with digestible of DM yield and as level of ADF decreases the digestible DM levels increases, the digestible DM yield of barley was 1916

kg/ha. Thus, with progressive harvesting stage the ADF level decreases while in vitro digestible DM yield increases [17].

The linear rises in energy yields may be because of the increase in DM yields gained per unit area. in conclusion, the DMD, OMD levels were higher in harvested in the heading stage comparing to other harvest stages. In contrast, the dry matter and organic matter yield were obtained per unit area (ha) were highest in the maturity levels [18].

Many studies were indicated that several biological processes can happen during germination leading to increase biological compounds and content of nutrients due to the activation of different enzymes in the sprouting phase [19], [20]. So, using

of sprouted barley in recent years as a feeding growing lamb was gained considerable attention due to its benefits such as improve potential health, improve with increase the number of bacteria that digest fiber and support short-chain fatty acids which enhance rumen health in addition, Al-Saadi and Al-Zubaidi noticed that lambs consuming sprouted barley had similar or slightly lower feed price weight gains with lower feed costs compare to control animals. Which has achievement in economic impact of lamb production fed sprouted barley [21]. Furthermore, the age and production system, animal species, and germination period effect on results in the feeding of sprouted barley. increasing the digestibility and intake of dry matter cause to higher nitrogen retention in the goats fed sprouted barley as showed by Helal [22]. Another study by Devendar et al., proved that 50% sprouted barley was improved the nitrogen balance in growth lambs.

Overall, this support that sprouted barley might be beneficial feed for animals due to it can improve digestibility, nutrient absorption and nitrogen retention. Different studies were reported that biochemical changing in barley seeds leading to improvement in digestibility of dry matter [23], [24]. Sprouted barley showed wide economic advantages, the cost of total feed for each lamb decreased with increasing sprouted barley content and reduce production cost of growing lambs.

Results showed the IVDMD and IVNDFD levels of sprouted barley after two days of incubation a quadratic effect with the stage of incubation. In the 4 days of incubation recorded the highest values. this result in the present study is consistent with other studies that showed germination increases rumen digestibility may be due to the conversion of complex nutrients into mono or easy nutrients different studies explained that and supporting the increasing digestibility of dry matter in sprouted barley that incubated in days 4 and days 8. On other hand, when incubation period prolonged may be leading to decrease the digestibility of sprouted barley this may be due to increasing the synthetic of carbohydrates Chavan, J. and Kadam,1989; Peer and Leeson, 1985 in current study IVDMD levels was increased during incubated period on day 4 after that it was decreased in day 8. Furthermore, the results of the in vitro digestibility (IVDMD) was agreed with the results by Peer and Leeson, when they explain that sprouted barley cultures was higher nutritional value from day 1 to 4 in ruminants feed [25], [26].

Many results also indicate that best day to cultivate sprouted barley was 4 days due to produce larger of total degradable fraction [27], [28]. As well as, different studies reported that the germination will increase the digestibility inside rumen but prolong the cultivation period could give opposite results. Furthermore, lower degradable fraction when cultivated barley in 8 days than 4 days this result may be because of higher amount of structural carbohydrates that lignin and hemicellulose were represented inside solid root [29], [30]. Overall, in the present study increasing structural carbohydrates like lignin, cellulose and hemicellulose in sprouted barley cause decrease the degradation rate of DM and NDF this study agreed with agreed with study Hobson and Stewart [31], [32].

CONCLUSION

The current study concluded that best cultivation period of sprouted barley was at 4 days and it was recommended as suitable period as feed source for ruminants. Because of highest nutrient availability and degradability without any opposite effects in vitro study on characteristics fermentation of rumen. On other hand,

Increase the period of cultivation stages cause decrease the concentrations of DM and OM digestibility. As well as, cultivated sprouted barley more than at 8 days could affect by producing hard and strong solid root that lead to a low digestibility because of the high concentrations of structural carbohydrates compared to 4 days.

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