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EVOLUTION OF SOME EGYPTIAN STRAINS BARLEY CULTIVATORS FOR GREEN FODDER HYDROPONIC SYSTEM AND PREDICTION DIGESTIBILITY VALUES BY IN-VITRO DAISY^{II} INCUBATOR

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SUMMARY

The hydroponic under Egyptian condition take more attention in the last decade. The experiment was conducted under net house in intensive hydroponic system and replicated three times during January and February 2017. The study was done to evaluate vegetative characteristics and quality properties of produced sprouting of six barley cultivars (Giza123,126,127,128,129 and130). The results observed that the sprouting can be produce in 8 days from planting to harvest using hydroponic technique under the net house conditions. The Highest green barley fodder was recorded with Giza 127 followed by 129 which gave 6.98, 6.83 Kg, respectively compared with other strain. The results indicated that the highest value of fresh sprout: seeds weight ratio was recorded significantly by Giza 127 followed by Giza 129 compared to the other four cultivars. The crude protein values in several green fodder barley species significant ($P<0.05$) increase (the range from 11.56 to 13.45%) compared with its grains (the range from 9.58 to 12.60%). The highest values CP% in green fodder barley recorded with (Giza 127) was (13.45% on DM basis). There were a significantly ($P<0.05$) increase for CF% between green fodder barley species (the range from 9.93 to 14.36) in 8- days sprouting compared with the several original barley grains (the range from 5.67 to 8.85%). Also, the EE were significant increased except (Giza 129 and Giza 130) were decreased. The highest significant values NDF was recorded (37.47%) with (Giza 123) compared several cultivator Green fodder barley species, but ADF was recorded (17.93) with (Giza 127). The highest significant values ADF and acid insoluble ash were recorded (5.91 and 1.78) with (Giza 130) compared several cultivator Green fodder barley species. The highest significant values hemicellulose was recorded (20.85%) with (Giza 123), celluloses was recorded (12.63%) with (Giza 126) compared several cultivator Green fodder barley species. however, significant increased NDF-cell soluble was recorded (80.88) with (Giza 130). The parameters of nutritive values are predication from chemical composition observed significant increase of DCP between seed barley and several cultivator Green fodder barleys except Giza (129) and (130). The highest result values of DCP cultivator Green fodder barley was recorded with (Giza127) the value increase from7.67% in seed to 8.44%in sprouting. The DDM and DMI were significantly decrease in all several cultivator Green fodder barleys compared with seed barley. Also, several cultivator Green fodder barley productions observed significantly decreased of TDN in all strains compared with its seeds. The parameters of energy values are predication from chemical composition of Egyptian barley for seed (Giza 128, Giza 127, Giza 130, Giza 129, Giza 126, and Giza 123) and it green fodder production observed significantly decreased of GE, NEL, NEM, NEg, DE and ME in all strains barely green fodder production compared with its seeds. Except the highest result prediction growth energy were recorded with seed Giza (129) compared with other barley strains, the values increase from 1.58 to 1.6 (MJ/Kg DM). Apparent dry matter and true dry matter digestibility by determination In-Vitro DaisyII incubator. The values in all several barleys green fodder was significant increase compared with its seeds. The highest values of seed barley were recorded with strain (Giza129) compared with other seed strains. Also, the best significant ($P<0.05$) values of data barley for green fodder production recorded with strains (Giza 129) compared with other strains (Giza 128, Giza 127, Giza 130, Giza 126, and Giza 123). Finally, the best significant ($P<0.05$) values of apparent dry matter and true dry matter digestibility of green fodder production was observed with strains (Giza129). The obtained results indicated that the highest values of economic production and profit were gained by Giza 127 and Giza 129 which gave 39.8 and 38.3LE/m2, 7.1 and 7.0 respectively with constant of other production costs. Conclusion This process takes place in a very versatile and intensive hydroponic growing unit, where only water and nutrients are used to produce a grass and root combination that is very highest values in nutrients, in physical characteristics, in digestibility analysis, high in protein and production costs. The best result recorded with Sprouted barley yield using Egyptian barley Giza 129 barely cultivar could be used animal's diets as hydroponic green forage in short period (8 days – 3.5 production cycles /month) any time from year. Under the conditions of this experiment, the fodder strains (Giza 129) best results indicated could be used animal's diets. These feeds are suitable for use at all types and categories of animals.

Keywords: *hydroponic system, barley seeds, sprouting, In- Vitro Daisy^{II} incubator, prediction energy and digestibility values.*

INTRODUCTION

One of the important modern techniques for better water use efficiency (WUE) as well as for fodder production is using hydroponic culture. Hydroponic fodder is a technique of growing seeds of crops such as barley, cowpea, sorghum, wheat, maize or etc. in a hygienic environment free of chemicals i.e. insecticides, herbicides, fungicides and artificial growth promoters (Jensen and Malter, 1995 and Al-Hashmi, 2008).The produced green fodder is extremely high in protein and metabolic energy, which is highly digestible by domesticated animals (Caderand Bill, 2002; Rajendra *el al.,* 1998 and Tudor *et al.,* 2003). Barley considers an imperative crude material for feed industry and generally utilized for creature sustaining as grain in domesticated animals (Yılmaz, 2007).

Research on hydroponically sprouted barley has shown an increase in fresh weight over the sprouting duration as well as changes in dry matter compared to dry seeds (Peer and Leeson 1985aand Trubey *et al.*, 1969).The gain in fresh weight has been mainly attributed to imbibition's of water constituting up to 80-90% of the fresh weight (Sneath and McIntosh, 2003).The sprouting of barley under net house system recorded the higher values of chemical analysis compared to sprouting under control cooling room. The economic benefits is considered when comparing the high cost of control cooling room and energy needs with the net cover system (El-Morsy*et al.,* 2013). Germination and sprouting activates enzymes that change the starch, protein, and lipids of the grain into simpler forms, for example, starch changes to sugars.

The whole product is then fed to the animals and the empty space in the chamber is used to germinate a new set of seeds (Mukhopad, 1994 and Cuddeford, 1989). All these special features of hydroponic culture make this methodology as one of the most important agricultural techniques in use for green forage production in many countries.

Chung *et.al.*(1989) found that in 5-day sprouts the fiber content was increased from 3.7% in un-sprouted barley seed to 6.0%. Traditional in vivo methods of determining digestibility are cost-prohibitive and time-consuming. As a result, *In-vitro* methods of determining digestibility have been developed for some species. Much of this work has been done in ruminant species and has provided estimates highly correlated to *In-vivo* digestibility values (Goldman *et. al.,* 1987andStern *et al.,* 1997).The in vitro procedure developed by Tilley and Terry (1963)has long been regarded as an accurate *In-vitro* method for predicting diet digestibility (Goldman *et al.,* 1987 and Stern *et al.,* 1997).Recently, a more efficient alternative to the Tilley and Terry (1963)method has been developed using the Ankom Daisy^{II} incubator (Ankom Technology Corp., Fairport, NY). Wilman and Adesogan (2000) compared the two methods and found the Daisy^{II} system provided slightly less accurate prediction of ruminant *In-vitro* digestibility. Lattimer *et al.*, (2007) reported that the Daisy^{II} could be used to predict valid estimates of DM digestibility (DMD) of high quality diets. Peer and Leeson1985a found significant losses in dry matter digestibility, which declined progressively during 7 to 8-day growing period nevertheless the digestibility of 4-day old sprouts barley was superior to original grain. However, according to Mansbridge and Gooch, 1985*In-vitro* digestibility of sprouts grown at 6 or 8 days ranged 72-74 percent that was not significantly different.

Agriculture is the most critical sector in term of the global climate change. Natural water resources are affected by global climate change so food production and sustainability are endangered (Falkenmark, 2007). It's expected that the global climate change cause negative impact on the grazing lands in arid and semi-arid regions (Hoffman and Vogel, 2008). The rain fall is reduced while environmental temperature is increased, so the grassland yields decrease and range and meadow deteriorated over the time. Agriculture is the most critical sector in term of the global climate change. Natural water resources are affected by global climate change so food production and sustainability are endangered (Falkenmark, 2007). It's expected that the global climate change cause negative impact on the grazing lands in arid and semi-arid regions (Hoffman and Vogel, 2008). The rain fall is reduced while environmental temperature is increased, so the grassland yields decrease and range and meadow deteriorated over the time.

The analysis is expressed on an as received and on 100% dry matter basis. Nutrient calculated by equations are expressed on this basis represent the nutrient content of the feed when it was received at the lab. There are several values that can be calculated from these lab measurements. A number of equations have been used to estimate digestibility and energy values of forages. According to N.R.C., (2001)total digestible nutrient (TDN) is calculated from ADF, estimates the energy in a forage available to support an animal's energy needs for body maintenance {net energy maintenance (NEm)}, {net energy lactation (NEL)}, or body weight gain {net energy growth (NEg)}. NEm and NEgare often used in balancing rations for growing cattle, and NEL is often used for dairy rations. Digestible Energy (DE) is the energy in forage that is not lost in feces. Metabolizable Energy (ME)estimates the energy in forage that is not lost in feces, urine, or rumen gases.

The main objectives of this study are localizing the know-how of using hydroponic culture in producing green fodder (sprout) in Egypt while investigated the suitable barley cultivar use under hydroponic culture.Determination digestibility values for green fodder by using *in-vitro* Daisy^{II} incubator and prediction nutritive, energy values from chemical composition to use in ruminant animal feeding.

MATERIALS AND METHODS

The experiment was carried out at Protected Cultivation Site, Central Laboratory for Agriculture Climate (CLAC), Agriculture Research Centre, Giza, Egypt during January and February 2017 under net house and replicated three times in this period.

Plant material:

Six barley (*Hordeum vulgare L.*) cv. cultivars seeds were evaluated in this study: Giza 123, Giza 126, Giza 127, Giza 128, Giza 129, and Giza 130. The different cultivars seeds were soaked in water separately, with the purpose of eliminating the whole material that floats. Then barley seeds were soaked in warm water (40^{o}C) containing 0.1% hypochlorite for 30 minutes then washed by tap water for 10 minutes. Planting trays also were cleaned and disinfected by using 0.1% hypochlorite and washed by tap water to remove any traces. Three growing periods during January and February2017 were cultivated through one growing period each 8 day. Average, min, max and average temperature were recorded (Fig.1).

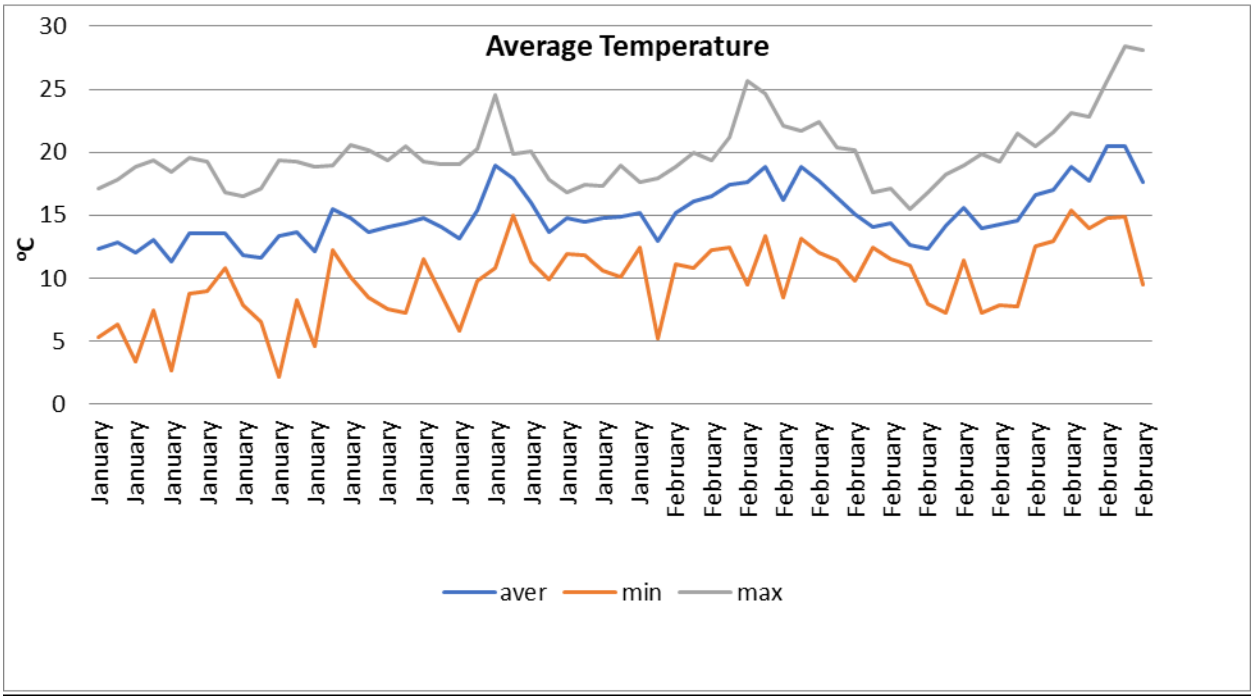

Fig: (1). Max, min and average temperature from January and February 2017 under the net house.

Hydroponic system:

Using intensive hydroponic system without inert material or soil for the process of barley germination, during each period (8 days) was done. The intensive hydroponic system constructed by using a steel stand, size 2.10×0.50×1.9 m equipped containing 6 shelves (30 cm apart shelves) with capacity of 42 polyethylene trays sized 60×30x3 cm (0.18 m^2) each (equivalent to about 10 kg/m^2) according to the results obtained by El-Morsy *et al.*, 2013. The hydroponic unit was located under white net house and covered by black net (63% shade) during the studied periods.

The irrigation of different shelves was designed depending on fog system. The irrigation water was delivered via 4 fog sprayers (32 L/hour) for each shelf. The fog system was automated by using digital timer (2 minutes/hour/24 hours) to control water pumping (water pump 0.5 horse powers) from water tank. Black polyethylene tank one cubic meter was used as irrigation water tank. The base of trays was holed to allow drainage of excess water of irrigation. The used water was tap water with free nutrient solution or any additives.

Sprout yield characteristics:

At the end of experiment (8 days after seeding), barley shoots and root mats (sprouts) in the trays of different cultivars were harvested and the following data were recorded total fresh and dry sprouts yields (Kg), shoot height (cm), and conversion factor (ratio of produced barley sprouts to the initial planted seed weight (Kg/Kg) were recorded.

Chemical analysis:

Representative samples of barley sprout (leaves plus roots) cultivar from each plot were air dried and taken for proximate analysis according to the procedures of AOAC (2000). Fiber fraction analysis: Natural detergent fiber (NDF), acid detergent fiber (ADF) and acid detergent lignin (ADL) contents of samples of barley sprout (leaves plus roots) were determined according to Van Soest *et al.* (1991). Cellulose (Cell.) and hemicellulose (Hem.) contents were calculated respectively, by subtracting (acid detergent lignin) ADL from ADF and ADF (acid detergent fiber) from (nutrient detergent fiber) NDF with using sodium sulfide by ANKOM 200 Fiber Analyzer (ANKOM, 2005).

Energy prediction:

Prediction of energy availability from laboratory analyses usually requires specific equations for each type of feed. The accuracy of energy predictions is a function of the accuracy of laboratory analyses and the accuracy of the animal experimentation used to develop the prediction equation, Available energy and digestibility cannot be measured in the laboratory and is estimated from chemical composition. Most energy values are predicted from fiber analyses because fiber is negatively related to the animal's ability to digest and use nutrients in the feed, the following equations according to N.R.C., (2001).

Equations:

DCP= digestible crude protein = (CP%*0.908)-3.77

DMI= Dry Matter Intake = 120/ NDF%.

DDM= Dry Matter Digestibility%= 88.9- (0.779*ADF%).

TDN= Total Digestible Nutrients (100%DM) = 96.35 - (0.70*%ADF).

NEL= Net Energy of Lactation (Mcal /Lb. of DM) = (TDN% X 0.01114)-0.054

NEM= Net Energy Maintenance (Mcal/Lb. of DM) = (TDN%X 0.01318)-132.

NEG= Net Energy Growth (Mcal/Lb. of DM) = (TDN%X0.01318)-0.459.

GE= Growth Energy (MJ/Kg DM) =0.0226*CP+0.0407*EE+0.0192*CF+0.0177*NFC according to Maff (1975)

DE= Digestible Energy (Mcal /Lb. of DM) = (0.04409*TDN)/2.204.

ME= Metabolizable Energy (Mcal /Lb. of DM) = (1.01*(0.04409*TDN))-0.45)/2.204.

NSC= Non- Structure Carbohydrate =100- (NDF%+CP%+EE%+ASH %)by (Mertens, 2002).

In- Vitro digestion with Ankom Daisy ^{II} incubator method:

In vitro digestibility's of feed ingredients and experimental rations were done by using the Ankom Daisy^{II} incubator procedure. The procedure followed is described in detail by Goeser and Combs (2009). Tilley and Terry (1963) were used for the determination of apparent dry matter digestibility (ADMD). True *In-vitro* DM digestibility (TDMD) was determined by measuring the neutral detergent fiber (NDF) in the residue from the incubation with rumen inoculum and buffer. Neutral detergent fiber digestibility (NDFD) was determined with Ankom Daisy^{II} incubator procedure. *In -Vitro* true digestibility and NDFD were calculated according to Ankom Daisy^{II} incubator method.

Economic efficiency:

Economic study depends on the cost and profit of the producing sprout of different cultivars barley was done. The cost and profit were calculated instead of the hydroponic system and labor costs to clarify the economics of different cultivars treatments. The profit and biomass rate were calculated as follows:

The profit (LE/m2) = production (LE/m2) – cost of seeds (LE/m2).

Biomass rate = total sprout fresh weight (kg/m2) / seeds weight (kg/m2).

Experimental design and statistical analysis:

Completely randomized blocks design was used with four replicates. Statistical analysis was determined by computer, using SAS program for statistical analysis. The differences among means for all traitswere tested for significance at 5% level according to the procedure described by Snedicor and Cochran (1981). The data of the three growing periods were analyzed and presented in this study as an average according to the high similarity results and to avoid the results duplication.

RESULTS AND DISCUSSION

The vegetative characteristics of sprouting produced by different barley cultivars:

The average production of different barley cultivars in hydroponic system (kg/day) during the three sprouting period in Table (1). The results indicated that the sprouting of green barley fodder can be produced in 8 days from planting to harvest using hydroponic technique for barley cultivars crops (Giza 123, Giza 126, Giza 127, Giza 128, Giza 129, and Giza 130). The data revealed that the changes of average sprout weight for tested cultivars were non-significant until the third day of the growing period while in the fourth day the cultivars changed their weight of sprouts ($P<0.05\%$) significantly. The highest significant average sprout weight value was recorded by Giza127(6.98 Kg) followed by Giza 129 (6.83 Kg) then Giza 128 (6.09 Kg). On the other hand, Giza 126 had the lowest value (5.09 Kg) of average fresh barley sprout weight. These results are the same to that was reported previously by Shtaya (2004). Grains of barley gained weight over the 8 days sprouting period as a result of water imbibitions.

Table (1): The average production of different barley cultivars in hydroponic system (kg/day) during the growing period.

Average production during three growing periods								
	Days after sowing (kg/day)							
Cultivar	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8
Giza 123	1	1.41^{a}	1.98^{a}	2.19^{c}	2.93^{b}	3.90^{c}	4.42^{c}	5.16^{d}
Giza 126	1	1.39^{a}	1.89^{a}	2.18^{c}	2.97^{b}	3.72^{c}	4.04^{d}	5.09^{d}
Giza 127	1	1.35^{a}	1.89^{a}	2.47^{a}	3.44^{a}	4.67^{a}	5.54^{a}	6.98^{a}
Giza 128	1	1.35^{a}	1.95^{a}	2.45^{ab}	3.34^{a}	4.33^{b}	5.02^{b}	6.09^{b}
Giza 129	1	1.39^{a}	1.99^{a}	2.41^{ab}	3.35^{a}	4.46^{ab}	5.59^{a}	6.83^{a}
Giza 130	1	1.34^{a}	1.94^{a}	2.3^{bc}	3.02^{b}	3.90^{c}	4.37^{c}	5.60^{c}

* *Means in each column followed by the same letter are not significantly different at 5% probability.*

The average daily ratio of fresh sprout weight for barley tested cultivars during the growing period was show in Fig. (2). The average fresh weight was increased weight in general about 1.41 to 1.34 times, their original pre-steeped weight after 1 day, the range from 1.45to 1.36 times after 2 days, the range from 1.45 to 1.11 times after 3 days, the range from 1.31 to 1.11 times after 4 days, the range from 1.39 to 1.31 times after 5 days then the increment ratio start to decrease down to 1.36 to 1.25 times after 6 days and 1.28 to 1.17 times after 7 days. According to Peer and Leeson(1985a) fresh weight was increased from 1.72 times of the original seed weight, after 1 day of sprouting, the white tip of the radical is visible. By the third day, the radical has branched and the blade inside the heath has turned green. After the fourth day, a green blade has protruded above the sheath and the roots of the kernels have formed a definite mat with other kernels. From the first and eighth day, the main visible change is the increase in root length and thickness. The effect of different barley cultivars in hydroponic system on shoot height of barley sprout was presented in Fig. (3). Data showed that the highest shoot was obtained with Giza 127 followed by Giza 129 (10 cm and 9.5 cm, respectively) and there were no significant differences between them. The lowest shoot height was obtained with Giza 126 (6.2 cm). Similar values were obtained by Al-Hashmi (2008) regarding to the sprout's height of hydroponic barley. However, the average sprout heights of barley cultivars showed significant differences among them.

Fresh sprout weight:

Seeds weight ratio of different cultivars was illustrated in Fig. (4), the results indicated that the highest value 5.81 of fresh sprout: seeds weight ratio (5.81 and 5.66) was recorded significantly by Giza 127followed by Giza 129 (5.66) compared to the other four cultivars. These values are the same to that the fresh sprout weight: seeds weight ratio the ranged from 5.81 to 3.86.Similar results were obtained by Al-Hashmi (2008) and Al-Karaki (2010) who reported that the ratio reached up to 8 times in barley sprouts produced via intensive hydroponic system but under full control system.Peer and Leeson(1985a)found that seed soaking leads to the activation of enzymes and solubilization and digestion of starch stored in the endosperm to simple sugars of the starch stored in the endosperm to simple sugars. This provides substrate for the young developing plant for metabolic activities. These substrates are respired to produce energy, giving off carbon dioxide and water. This loss of carbon dioxide leads to a loss in dry matter. These results were in accordance with those of Bautista(2002) and Morgan *et al.*, (1992) who reported a significant difference in wet weight (WW) and dry weight (DW) of the hydroponic fodder.

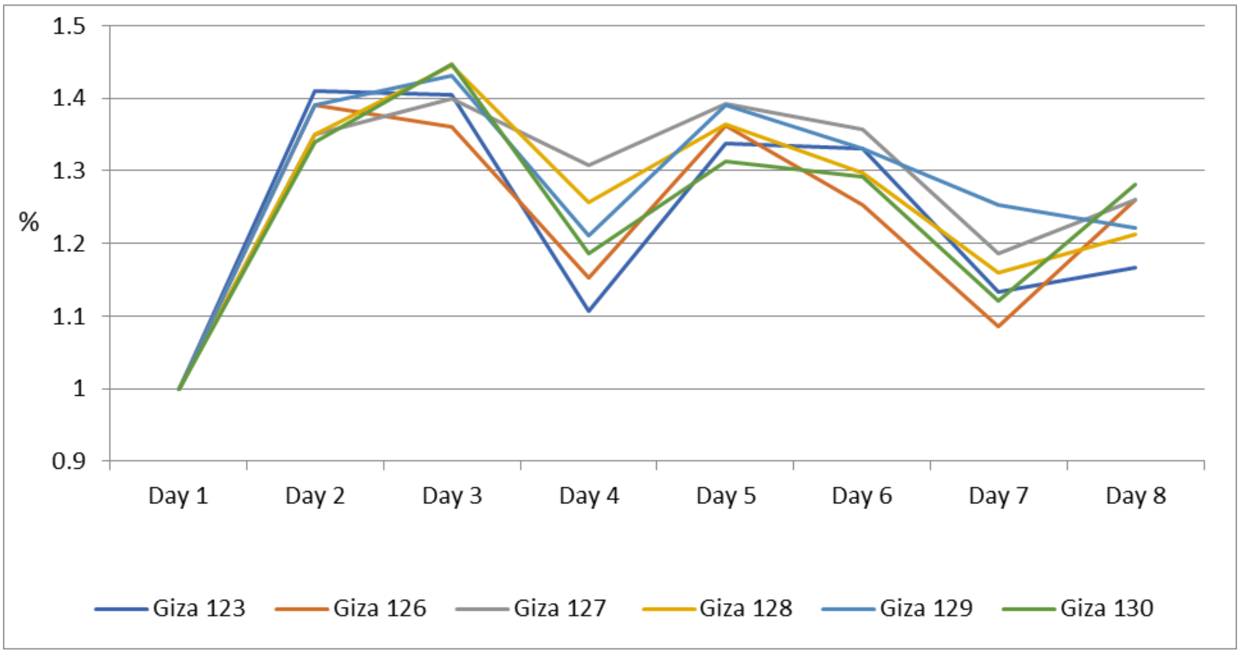

Fig. (2): The average of fresh barley sprouts weight increase / day ratio during the growing period.

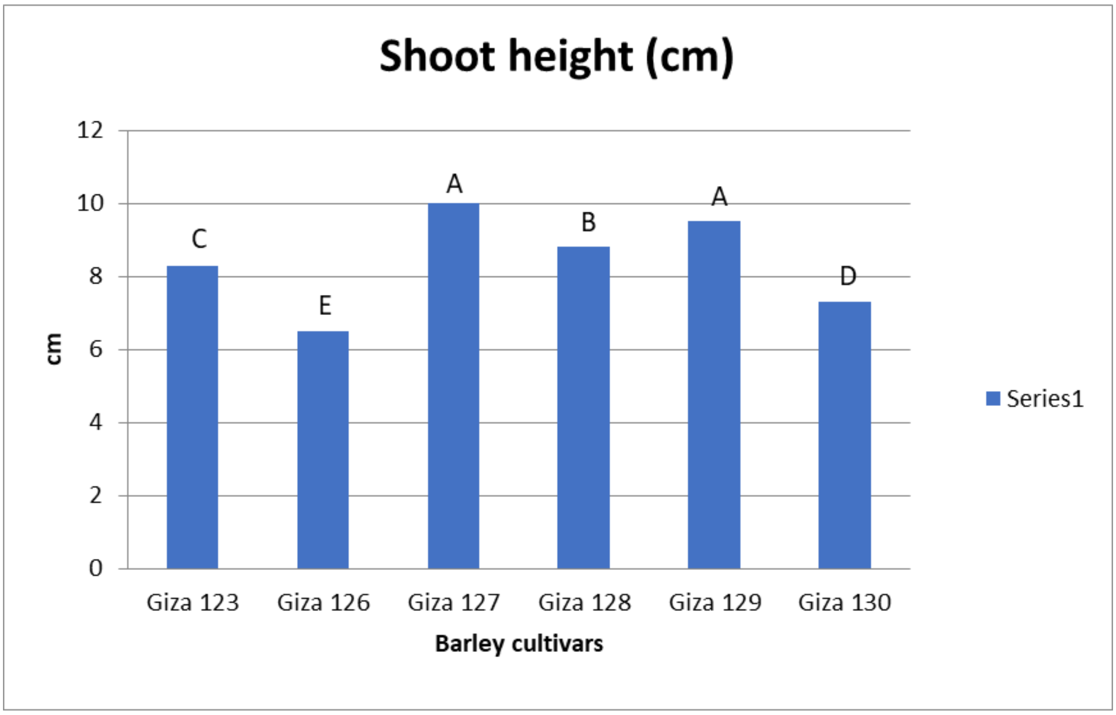

Fig. (3): The effect of barley cultivars on shoot height (cm).

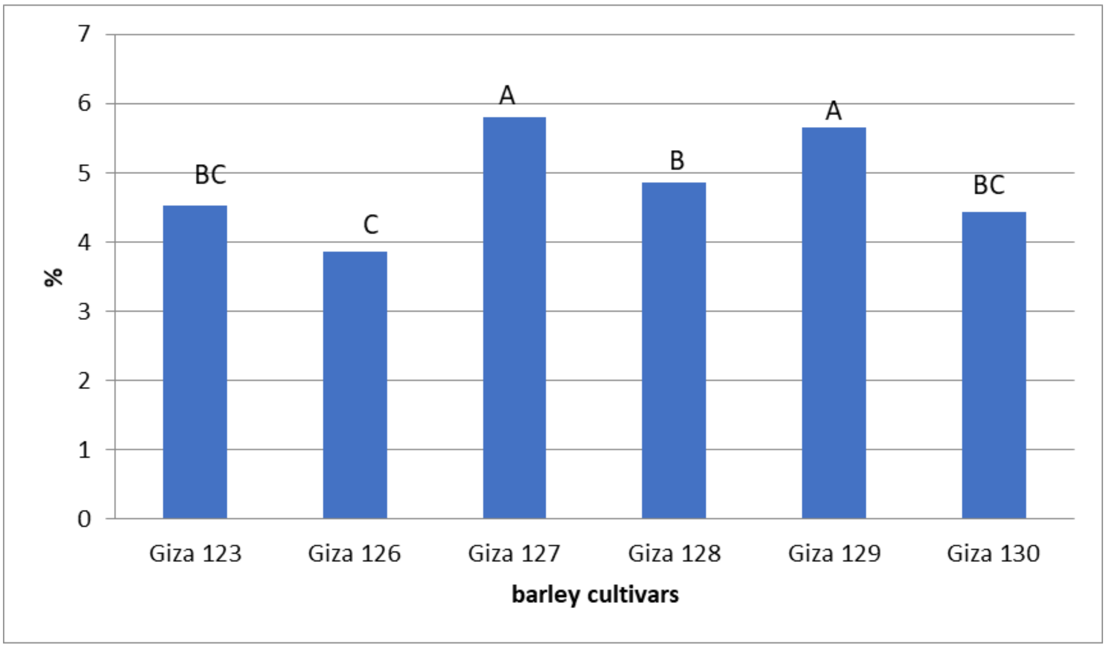

Fig. (4): The average of barley sprout weight: seeds weight ratio of different barley cultivars.

Chemical composition:

Chemical composition of the several un-sprouted seeds barley strain and its cultivatorsgreen fodder barley (sprouted) were produced at a hydroponicare shown in Table (2). The significant (P<0.05) increase DM in sprouting barley by means (87.89%) compares with other seeds (91.97%). But there are insignificant values between several un-sprouted seeds barley and also between several cultivator's green fodder barley test strain.

An insignificant (P<0.05) differences among several cultivator'sgreen fodder of Egyptian barley in mean values was found only in the case of DM (range 91.22 to 92.37). The significantly (P<0.05) increase OM of sprouting barley green compared with its seed. Chavan and Kadam (1989) found the nutrients changes in sprouting grains by enhancing the time of sprouting, the higher organic matter, particularly starch consumed to support the metabolism and energy requirement of the growing.

The CP% values in several cultivator green fodder barley strains significant (P<0.05) increase(the range from 11.56 to 13.45%) compared with its un- sprouting strains (the range from(9.58 to 12.60%) of Giza123, 126, 127 and 128 except cultivator green fodder barley(Giza 129 and Giza 130) the CP values (8.84 and 10.3%) were significant (P<0.05) decrease compared with un-sprouted barley strains (11.97 and 11.04%) but the highest values was observed with green fodder barley specie (Giza 127) (13.45%). The CP contents could be affected by the cultivation conditions in hydroponic systems. The CP obtained in this study was comparable with those reported by Al-Ajmi *et al*., (2009) and Morgan *et al.* (1992) reported that CP content was increased from 10.8 at day 4 to 14.9 percent at day 8 in hydroponically barley fodder that were in accordance with our findings. But, Snow *et al.* (2008) reported that a higher CP content (16.13%) was recorded with the hydroponically barley fodder. Sneath and McIntosh (2003) evaluated the composition of sprouted barley and reported that the CP ranged from 11.38 to 24 percent. Chavan and Kadam (1989) observed increases in protein quality in sprouting barley, very complex qualitative changes are reported to occur during soaking and sprouting of seeds. The conversion of storage proteins of cereal grains into albumins and globulins during sprouting may improve the quality of cereal proteins. Many studies have shown an increase in the content of the amino acid Lysine with sprouting. An increase in proteolytic activity during sporting is desirable for nutrition improvement of cereals because it leads to hydrolysis of prolamins and the liberated amino acids such as glutamic and proline are converted to limiting amino acids such as lysine.

There were a significantly ($P<0.05$) increase for CF% between with green fodder barley species (the range from 9.93 to 14.36) in 8- days sprouting compared with several un-sprouted barley strains (the range from 5.67 to 8.85%), and there were significant values between several strain barely Also, the EE were significant increased values between seeds and sprouting except (Giza 129 and Giza 130) were slightly decreased. Peer and Leeson (1985b), stated that, crude fiber in sprouting green barley a major constituent of cell walls, increases both in percentage and real terms, with the synthesis of structural carbohydrates, such as cellulose and hemicellulose. This result is agreement with Chung *et al.,* (1989) who found that the fiber content increased from 5.4% un-sprouted barley seed to 14.1% after 7-days sprouting.

The NFE and NSC were significantly decreased ($p<0.05$) in Green fodder barley (GF) compared to the other barley seed except green fodder barley (Giza 123) was significant ($P<0.05$) increase in the value NFE, there were significant different between several Egyptian sprouted and several seed strain.Ash values in several green fodder barleys are decreased compared with its barley seed this result according to Kent and Amos (1967)observed after 6 days of growing, starch accounted for 53-67% of the dry weight of barley seed, so any decrease in the amount of starch would cause a corresponding decrease in NFE and DM as well. The increase in EE could be due to the production of chlorophyll associated with plant growth that is recovered in ether extract measurement (Mayer and Poljakoff-Mayber (1975). Such changes in nutrients profile and recovery are misleading since they only described the alterations in the proportion of nutrients during growth and sprouting of seeds (Morgan *et al.,* 1992). A change in weight of any one of the nutrient leaded to proportional changes in other compositions. During the germination and early stage of plant growing, starch was catabolized to soluble sugars for use in respiration and cell-wall synthesis (Morgan*etal*,.1992). Morgan *et al.* (1992)who found that ash content of sprouts increased from day 4 corresponding with the extension of the root, which allowed mineral uptake. They reported that ash content changed from 2.1 in original seed (barley) to 3.1 and 5.3 at day 6 and 8, respectively and they recorded DM losses ranging 7-18% which is mostly non-fiber carbohydrate. In the other hand, the structural carbohydrate increased in sprout green forage. These changes affected the proportion of the other nutrients such as protein that could be shown a higher percentage. Fazaeli *et al., (*2012) reported that, the Ash, EE, NDF, ADF and WSC were increased but OM and NFC decreased ($p<0.05$) in GF compared to the initial barley grain. The CP content was significantly ($p<0.05$) increased only at day 8. By extending the growing period from day 6 to day 8, the CP, Ash, EE, NDF and ADF were increased but NFC and WSC reduced.

Fiber fraction:

The effect comparison of used some Egyptian barley cultivars for green fodder production in intensive hydroponic system of six barley cultivars (Giza 128, Giza 127, Giza 130, Giza 129, Giza 126, and Giza 123) under hydroponic in the present investigation, fiber fraction of the several seed barley and several cultivator Green fodder barleys were produced at a hydroponic are shown in table (3). The NDF, ADF, ADL, acid insoluble ash values in several cultivator green fodder barley strain was significant increase compared with several original barley seeds. The highest significant values NDF and cellulose were recorded (37.47%and 20.85%) with sprouting (Giza 123) compared several cultivator Green fodder barley strains, but ADF was recorded (17.93%) with sprouting (Giza 127). The highest significant values ADL and AIA were recorded (5.91%and 1.78%) with sprouting (Giza 130) compared several cultivator green fodder barley strains. The highest significant values celluloses were recorded (12.63%) with sprouting (Giza 126) compared several cultivator green fodder barley strains. however; significant increased NDF-cell soluble was recorded (80.88%) with (Giza 130). The different significant values between the several Egyptian strains in fiber fraction determination. The NDF and ADF were increased but NDF-cell soluble reduced obtained in this study was agreement with Fazaeli *et. al.* (2012).

Predicting feeding valuesfrom chemical composition:

Results in table (4) observed significant increase of DCP between seed barley and several cultivator Green fodder barleys except Giza (129) and (130). The highest result values of DCP cultivator Green fodder barley was recorded with (Giza127) the value increase from7.67% in seed to 8.44%in sprouting Green fodder. The DDM and DMI were significantly decreased in all several cultivator Green fodder barleys compared with its seed. Also, several cultivator Green fodder barley productions observed significantly decreased of TDN in all strains compared with its seeds. The significant highly means values of sprouting several barleys compared with its seed of digestible protein, but the means value of DDM, TDN and DMI were significant decrease in sprouting barley compared with its seed. The means values between different strains significant different, the best strain of TDN and DMI recorded with Giza (129) and DCP recorded with Giza (127)

Table (2): The effect of sprouting produced by different barley cultivars on chemical composition: -

Cultivar	Seed	sprout	Mean	Seed	Sprout	Mean	Seed	Sprout	Mean
	Dry matter (DM)			OM			Crude protein (CP)		
Giza 123	88.02^{b}	92.28^{a}	90.15 A	82.48^{bc}	89.32 a	95.75 A	11.95^{abc}	12.64^{ab}	12.29 A
Giza 126	87.92^{b}	91.93^{a}	89.93 B	81.55^{c}	88.37^{ab}	95.04 A	10.58^{cde}	13.13^{a}	11.85 AB
Giza 127	87.82^{b}	92.37^{a}	90.15 A	82.71^{bc}	92.37^{a}	95.38 A	12.60^{ab}	13.45^{a}	13.03 A
Giza 128	88.26^{b}	92.1^{a}	90.18 A	79.95^{d}	92.1^{a}	93.72 B	9.58^{de}	11.56^{abc}	10.57 BC
Giza 129	87.54^{b}	91.93^{a}	89.74 A	82.68^{abc}	88.30^{ab}	95.76 A	11.97^{abc}	8.84^{e}	10.41 C
Giza 130	87.78^{b}	91.22^{a}	89.51 A	82.37^{bc}	87.30^{ab}	95.34 A	11.04^{bcd}	10.30^{cde}	10.67 BC
Mean	87.89 B	91.97 A		94.16 B	96.26 A		11.28 A	11.65 A	
	Ether extract (EE)			ASH			Nitrogen free extract (NFE)		
Giza 123	3.25^{c}	3.49^{b}	3.37 B	5.54^{c}	2.96^{i}	4.25 D	70.41^{h}	71.22^{f}	70.82 D
Giza 126	2.62^{e}	2.81^{d}	2.72 D	6.37^{b}	3.56_{h}	4.97 B	72.79^{d}	67.32^{l}	70.15 F
Giza 127	3.30^{c}	3.71^{a}	3.51 A	5.11^{d}	4.14^{f}	4.63 C	72.50^{e}	67.71^{k}	70.11 E
Giza 128	2.10^{f}	3.24^{c}	2.67 D	8.31^{a}	4.25^{f}	6.28 A	75.35^{a}	70.18^{i}	72.77 A
Giza 129	2.90^{d}	2.58^{e}	2.74 D	4.86^{e}	3.63^{h}	4.24 D	74.60^{b}	70.58^{g}	72.59 B
Giza 130	3.24^{c}	2.94^{d}	3.09 C	5.41^{c}	3.92^{g}	4.66 C	73.46^{c}	69.65^{j}	71.56 C
Mean	2.90 B	3.13 A		5.93 A	3.74 B		73.19 A	69.44 B	
	Crude fiber (CF)			(NFC%)					
Giza 123	8.85^{g}	9.93^{f}	9.39 D	57.78^{f}	43.67^{j}	50.73 E			
Giza 126	7.64^{h}	13.18^{c}	10.41 A	58.31^{e}	46.47^{i}	52.39 D			
Giza 127	6.49^{j}	10.97^{d}	8.73 E	59.87^{c}	41.47^{k}	50.67 E			
Giza 128	4.66^{l}	10.77^{e}	7.71 F	59.49^{d}	47.76^{h}	53.63 C			
Giza 129	5.67^{k}	14.36^{a}	10.02 C	60.95^{a}	57.78^{f}	59.36 A			
Giza 130	6.85^{i}	13.63^{b}	10.24 B	60.65^{b}	52.91^{g}	56.78 B			
Mean	6.69 B	12.14 A		59.51 A	48.34 B				

Dry matter (DM), Crude protein (CP), Crude fiber (CF), Ether extract (EE), Nitrogen free extract (NFE),Non-Neutral Detergent Fiber Carbohydrate[NFC% =100% - (CP% + NDF% + EE% + Ash%)]by (Mertens, 2002).

a,b,d,f,g,h,k,l,i,j,e means with difference latter at the same column are significantly (p,<0.05) different.

Table (3):The effect of sprouting produced by different barley cultivarson fiber fraction:

Cultivar	Seed	Sprout	Mean	seed	sprout	Mean	seed	Sprout	Mean
	NDF %			ADF %			ADL %		
Giza 123	21.48[h]	37.47[a]	29.5 A	8.11[f]	16.62[b]	12.4 B	1.76[i]	5.40[b]	3.6 C
Giza 126	22.12[g]	34.03[c]	28.1 C	8.03[f]	16.64[b]	12.4 B	1.83[h]	4.01[e]	2.9 E
Giza 127	19.12[l]	37.23[b]	28.2 B	7.09[g]	17.93[a]	12.5 A	2.12[g]	5.30[c]	3.7 B
Giza 128	20.52[i]	33.19[d]	26.8 D	6.86[h]	15.74[c]	11.3 C	1.86[h]	5.07[d]	3.5 D
Giza 129	19.32[k]	27.17[f]	23.2 F	5.59[j]	12.51[d]	9.1 D	3.83[f]	3.83[f]	3.8 A
Giza 130	19.66[j]	29.93[e]	24.8 E	6.73[i]	11.47[e]	9.1 D	1.69[j]	5.91[a]	3.8 A
Mean	20.4 B	33.2 A		7.1 B	15.2 A		2.2 B	4.9 A	
	Hemicellulose %			Cellulose %			Lignin %		
Giza 123	13.37[h]	20.85[a]	17.1 A	6.36[f]	11.22[b]	8.8 B	1.76[hi]	4.50[b]	3.1 B
Giza 126	14.11[f]	17.39[c]	15.7 C	6.19[g]	12.63[a]	9.4 A	1.83[gh]	3.00[e]	2.4 E
Giza 127	12.03[j]	19.90[b]	15.9 B	4.97[i]	10.67[c]	7.8 C	2.12[f]	4.61[a]	3.4 A
Giza 128	13.66[g]	17.45[c]	15.5 D	5.03[h]	8.57[d]	6.8 D	1.86[g]	4.17[c]	3.0 C
Giza 129	13.74[g]	14.65[e]	14.2 E	3.89[j]	8.57[d]	6.2 E	1.70[i]	3.16[d]	2.4 E
Giza 130	12.94[i]	15.46[d]	14.2 E	5.04[h]	7.14[e]	6.1 F	1.69[i]	4.13[c]	2.9 D
Mean	13.3 B	17.6 A		5.2 B	9.8 A		1.8 B	3.9 A	
	AIA %			NDF-cell. soluble %					
Giza 123	0.70[e]	0.89[c]	0.79 B	78.52[e]	62.53[l]	70.5 F			
Giza 126	0.53[g]	1.00[b]	0.76 C	77.88[f]	65.97[j]	71.9 D			
Giza 127	0.62[f]	0.69[e]	0.65 D	80.88[a]	62.76[k]	71.8 E			
Giza 128	0.75[d]	0.89[c]	0.82 B	79.48[d]	66.81[i]	73.1 C			
Giza 129	0.66[ef]	0.68[e]	0.67 D	80.68[b]	72.83[h]	76.8 A			
Giza 130	0.68[e]	1.78[a]	1.23 A	80.34[c]	73.07[g]	76.7 B			
Mean	0.66 B	0.98 A		79.6 A	67.3 B				

NDF= Neutraldetergent fiber, ADF= acid detergent fiber, ADL= acid detergent lignin,

Hem= hemicellulose, Cell= cellulose, AIA= acid insoluble ash.

a,b,d,f,g,h,k,l,i,j,e means with difference latter at the same column are significantly (p,<0.05) different

Table (4): The effect sprouting produced by different barley cultivars on predicting feeding values from chemical composition.

Cultivar	Seed	Sprout	Mean	Seed	sprout	Mean
	DCP %			DDM %		
Giza 123	7.08^{d}	7.71^{c}	7.4 B	82.58^{f}	75.95^{j}	79.2 E
Giza 126	5.84^{g}	8.15^{b}	6.9 C	82.66^{e}	75.94^{j}	79.3 D
Giza 127	7.67^{c}	8.44^{a}	8.1 A	83.38^{d}	74.93^{k}	79.1 F
Giza 128	4.93^{i}	6.73^{e}	5.8 E	83.56^{c}	76.64^{i}	80.1 C
Giza 129	7.10^{d}	4.26^{j}	5.7 F	84.55^{a}	79.15^{h}	81.8 A
Giza 130	6.25^{f}	5.58^{h}	5.9 D	83.66^{b}	79.96^{g}	81.7 B
Mean	6.5 B	6.8 A		83.4 A	77.1 B	
	TDN %			DMI%		
Giza 123	90.67^{e}	84.72^{i}	87.7 C	5.59^{d}	3.20^{i}	4.4 D
Giza 126	90.74^{e}	84.7^{i}	87.7 C	5.42^{e}	3.53^{h}	4.4 D
Giza 127	91.39^{d}	83.8^{j}	87.5 D	6.28^{a}	3.22^{i}	4.8 C
Giza 128	91.55^{c}	85.33^{h}	88.4 B	5.85 ^{c}	3.62^{h}	4.7 C
Giza 129	92.44^{a}	87.59^{g}	90.0 A	6.21^{ab}	4.42^{f}	5.3 A
Giza 130	91.64^{b}	88.32^{f}	89.9 A	6.10^{b}	4.01^{g}	5.1 B
Mean	91.4 A	85.7 B		5.9 A	3.7 B	

a,b,c,d,f,g,h,k,l,i,j,e means with difference latter at the same column are significantly (p,<0.05) different

The effect sprouting produced by different barley cultivarsPredicting energy parameters from chemical composition:

The effect comparison of used some Egyptian barley cultivars for green fodder production in intensive hydroponic system on energy parameters are shown in table (5). The parameters of energy values are predication from chemical composition of Egyptian barley for seeds Giza (128, 127, 130, 129, 126, and 123) and its green fodder production observed significantly decreased of GE, NE_L, NE_M, NE_g, DE and ME in all several barleys green fodder production compared with its un-sprouted seeds. Except the highest result prediction growth energy (GE)was recorded with seed Giza (129) compared with other barley strains, the values increase from 1.58 to 1.6 (Mcal /Kg DM). Alderman (1985) reported the prediction metabolizable Energy (ME) in the barley green 0.73fodder was 11.69 MJ/kg DM (for ruminants). The means values of seeds were significant decreased compared with sprouting. The means values between strain was significant increase in strain (129 and 130) of DE (Mcal /Lb. of DM). There are different significant means value between seed strains, the best significant results between different strains recorded with Giza (129) of GE, NE_M, NE_g, DE and ME, The values were 1.59,1.05, 0.73,1.80 and 1.56, respectivelly

Dung *et al.*, (2010) found that the energy value of the sprouts was also lower than that of the grain on a DM basis, with a gross energy loss of 2% recorded after comparing the sprouts with the original grain. In addition to this nutrient analysis, they also analyzed the digestibility of the fodder versus original grain in situ. In line with the previously presented material, they found no significant difference in the digestibility and concluded loss of total DM without a significant improvement in digestibility, represents a considerable reduction in total digestible energy.

Table (5): The effect sprouting produced by different barley cultivars on predicting energy from chemical composition.

Cultivar	Seed	sprout	Mean	Seed	Sprout	Mean	Seed	sprout	Mean
	GE (MJ/Kg DM)			NE_L(Mcal/Lb.of DM)			NE_M (Mcal/Lb. of DM)		
Giza 123	1.59^{a}	1.39^{e}	1.49^{c}	0.96^{a}	0.89^{a}	0.92 ^{a}	1.06^{b}	0.98^{d}	1.02 ^{b}
Giza 126	1.52^{c}	1.49^{c}	1.50^{c}	0.96^{a}	0.89^{a}	0.92 ^{a}	1.06^{b}	0.98^{d}	1.02 ^{b}
Giza 127	1.6^{e}	1.40^{c}	1.50^{c}	0.96^{a}	0.88^{a}	0.92 ^{a}	1.07^{ab}	0.97^{d}	1.02 ^{b}
Giza 128	1.44^{d}	1.45^{d}	1.44^{d}	0.97^{a}	0.90 ^{a}	0.92 ^{a}	1.07^{ab}	0.99^{d}	1.03 ^{b}
Giza 129	1.58^{a}	1.60^{a}	1.59^{a}	0.98^{a}	0.92^{a}	0.93 ^{a}	1.09^{a}	1.02^{c}	1.05 ^{a}
Giza 130	1.59^{a}	1.55^{b}	1.56^{b}	0.97^{a}	0.93^{a}	0.95 ^{a}	1.08^{ab}	1.03^{c}	1.05 ^{a}
Mean	1.55^{a}	1.48^{b}		0.96 ^{a}	0.90^{b}				
	NE_g(Mcal/Lb. of DM)			DE (Mcal /Lb. of DM)			ME (Mcal /Lb. of DM)		
Giza 123	0.74^{ab}	0.66^{d}	0.70 ^{a}	1.81^{ab}	1.69^{e}	1.75 ^{b}	1.63^{ab}	1.51^{c}	1.57 ^{c}
Giza 126	0.74^{ab}	0.66^{d}	0.70 ^{a}	1.82^{a}	1.69^{e}	1.76 ^{b}	1.63^{ab}	1.51^{c}	1.57 ^{c}
Giza 127	0.75^{ab}	0.65^{d}	0.70 ^{a}	1.83^{a}	1.68^{e}	1.76 ^{b}	1.64^{a}	1.49^{c}	1.56 ^{c}
Giza 128	0.75^{ab}	0.67^{cd}	0.71^{a}	1.83^{a}	1.71^{de}	1.77 ^{ab}	1.65^{a}	1.42^{d}	1.53 ^{c}
Giza 129	0.76a	0.70 ^{bcd}	0.73^{a}	1.85^{a}	1.75^{cd}	1.80 ^{a}	1.66^{a}	1.65^{a}	1.65 ^{a}
Giza 130	0.75^{ab}	0.71^{bc}	0.73^{a}	1.83^{a}	1.77^{bc}	1.80 ^{a}	1.65^{a}	1.58^{b}	1.61 ^{b}
Mean	0.75 ^{a}	0.67 ^{b}		1.83 ^{a}	1.72 ^{b}		1.64^{a}	1.53^{b}	

a,b,c,d,f,g,h,k,l,i,j,e means with difference latter at the same column are significantly (p,<0.05) different

Determination digestibility by In-VitroDaisy^{II} incubator:

Data about effect comparison of used some Egyptian barley cultivars for seed and its green fodder production in intensive hydroponic system are observed in Table (6) on apparent dry matter and true dry matter digestibility by determination *In-Vitro* Daisy^{II} incubator. The values in all several barleys green fodder was significant increase compared with its un-sprouted seeds. The highest values of seed barley were recorded with strain (Giza129) compared with its un-sprouted seed. The values of apparent dry matter digestibility and true dry matter digestibility were significant increased from 87.15%, 40.69% to 93.99%and 83.15%, respectively. Also, the best significant (P<0.05) values of data barley for green fodder production recorded with strains (Giza 129) compared with all other strains (Giza 128, 127, 130, 126, and 123). The means values different significant between seeds the best digestible seeds recorded with Giza (129) .Dung *et al.*, (2010) studied the *In-Sacco* digestibility of sprouted barley fodder visa vs. grain. They found the loss of DM and no difference in *In-Sacco* digestibility disproved there being an advantage in sprouts rather than the original grain. They found that the initial degradation of the whole sprout was significantly (P<0.05) higher than for cracked grain after six hours of incubation in the rumen, but from 12 – 96 hours there were no significant differences between the whole sprouts and cracked grain. In this respect, Fazaeli *et. al.*, (2012) mentioned that, the DM content of green fodder (GF) was significantly (P<0.05) reduced by increasing the growing periods from 6 to 7 days. The amount of fresh Gf obtained per kg of planted barley grain was several times, but this increase was due to the large uptake of water during germination of the seeds, resulted in a sharply reducing of DM percentage in GF. Also, these results were in accordance with those of Bautista (2002) and Morgan *et. al.*, (1992)who reported a significant difference in wet weight (WW) and dry weight (DW) of the hydroponic fodder. Mariana Petkova (2017) reported that the Hydroponic green fodder increased digestibility of the ration. El-Morsy *et. al.*, (2013) stated as sprouting of grains affected the enzyme activity, changes in amino acid profile and increased the total protein which is highly digestible by most animals.

Table (6): The effect sprouting produced by different barley cultivarsondetermination digestibility by *In-Vitro*Daisy^{II}incubator: -

	IV-TDMD			IV-ADMD		
Cultivar	Seed	Sprouting	Mean	Seed	Sprouting	Mean
Giza 123	82.59^{h}	91.29^{d}	86.9 ^{d}	44.08^{h}	75.27^{c}	59.7 ^{b}
Giza 126	84.64^{g}	92.19^{c}	88.4 ^{c}	49.98^{g}	72.62^{e}	61.3 ^{a}
Giza 127	85.93^{f}	90.92^{d}	88.4 ^{c}	44.84^{h}	70.00^{f}	57.4 ^{d}
Giza 128	85.86^{f}	92.63^{c}	89.2 ^{b}	43.05^{i}	73.70^{d}	58.4 ^{c}
Giza 129	87.15^{e}	93.99^{a}	90.6 ^{a}	40.69^{j}	83.15^{a}	61.9 ^{a}
Giza 130	84.57^{g}	93.31^{b}	88.9 ^{b}	36.46^{k}	81.26^{b}	58.9 ^{C}
Mean	85.1 ^{b}	92.4 ^{a}		43.2 ^{b}	76.0 ^{a}	

IV-TDMD = in vitro true dry matter digestibility. IV-ADMD = In vitro apparent dry matter digestibility

a,b,c,d,f,g,h,k,l,i,j,e means with difference latter at the same column are significantly (p,<0.05) different

Economical study:

Data in Table (7) illustrated that the effect of different barley cultivars seeds on the cost and profit of forage production. The obtained results indicated that the highest values of economic production and profit were gained by Giza 127 and Giza 129 which gave 39.8 and 38.3LE/m2, 7.1 and 7.0 respectively with constant of other production costs. In this respect, Gebremedhin (2015) reported that the feeding of hydroponically grown maize and barley fodder for growing goats increased the total DM intake, feed conversion efficiency, body weight gain and economically valid. Also, agreement results were displayed by (Hassan and Mona 2013) in sprouted maize fodder fed to desert goats and reported, environmentally friendly as well as reduced cost of feeding, while, Naik *et al.* (2013) revealed increase in milk yield by 0.5-2.5litres/animal/day and earned net profit of Rs. 25-50 due to feeding of hydroponic fodder to their dairy animals. Bradley and Marulanda (2000) reported that hydroponic green fodder production technique requires only about 10–20% of the water needed to produce the same amount of crop in soil culture.

Table (7): The effect of sprouting produced by different barley cultivars on the average of cost and profit of production: -

Treatment	Seeds weight kg /m^2	Cost of seed (Kg = 3 LE) LE/m^2	Fresh weight Kg/m^2	Production (Kg=1.25LE) LE/m^2	The profit LE / m^2	Biomass
Giza 123	10a	30a	51.6d	64.5d	21.6d	5.2d
Giza 126	10a	30a	50.9d	63.6d	20.9d	5.1d
Giza 127	10a	30a	69.8a	87.3a	39.8a	7.1a
Giza 128	10a	30a	60.9b	76.1b	30.9b	6.1b
Giza 129	10a	30a	68.3a	85.4a	38.3a	7.0a
Giza 130	10a	30a	56.0c	70.0c	26.0c	5.6c

** a,b,c,d means with difference latter at the same column are significantly (p,<0.05) differentSimilar letters indicate non-significant at 0.05 levels.*

CONCLUSION

Climate change impacts on agriculture system take in high consider through study the efficiency of intensive hydroponic system in producing green fodder. The sprouting of barley under intensive hydroponic system recorded into a high quality, highly nutritious, disease free animal food. This process takes place in a very versatile and intensive hydroponic growing unit, where only water and nutrients are used to produce a grass and root combination that is very highest values in nutrients, in physical characteristics, indigestibility analysis, high in protein and production costs. The best result recorded with sprouted barley yield using Egyptian barley Giza 127 and Giza 129 barley cultivar may be could use in animal's diets as hydroponic green forage in short period (8 days – 3.5 production cycles /month) any time from year .Barley sprouts is considered the best choice that can be used for production of hydroponic green fodder with less water consumption; especially seeds of this crop are mostly available in the market at lower price than others which reduce the cost of hydroponic fodder production

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تقدير بعض من اصناق الشعير المصرى المزروع كاعلف اخضر بنظام الزراعة المائية والتبؤ بالقيم الهضمية بواسطة طريقة In-vitro Daisy^{II}incubator

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أخذت الزراعة تحت الظروف المصرية المزيد من الاهتمام في العقد الماضي. وتم إجراء التجربة تحت النظام المائي المكثف وتم تكرارها ثلاث مرات خلال شهري يناير وفبراير 2017. وقد أجريت هذه الدراسة لتقييم الخصائص الخضرية وخصائص الجودة لانتاج ستة أنواع من الشعير (الجيزة 122،126،127،128،129 و 130). وأظهرت النتائج أن المستنب يمكن أن ينتج في 8 أيام من الزراعة إلى الحصاد. باستخدام تقنية الزراعة المائية تحت ظروف الصوب المغطاة بالنت. وسجل أعلى اعلاف خضراء في الجيزة 127 ، يليه الجيزة 129 ، أعطى 6.98 ، 6.83 كجم ، على التوالي مقارنة مع السلالات أخرى. أوضحت النتائج أن أعلى قيمة من المستنبت الطازج: وزن البذور تم تسجيلها بشكل ملحوظ فى الجيزة 127 تليها الجيزة 129 مقارنة بالأصناف الأربعة الأخرى.

ترتفع قيم المعنوية (P <0.05) للبروتين الخام في العديد من أنواع الشعير المستبت كعلف اخضر التى (تتراوح بين 11.56 و 13.45٪) مقارنة ببذورها و (تتراوح من 9.58 إلى 12.60٪). وسجلت أعلى نسبة مئوية للبروتين فى بذور الشعير المستبت كعلف اخضر صنف (الجيزة 127) بنسبة (13.45٪ على أساس المادة الجافة).تم تسجيل أعلى قيم معنوية مع (ADF) والرماد غير الذائب بنسبة(5.91% و 1.78%) على التوالى مع (الجيزة 130) مقارنة بالاصناف الاخرى من بذور الشعير. تم تسجيل أعلى نسبة معنوية من تقدير الهيميسيلولوز (20.85٪) مع الصنف (الجيزة 123) ، وسجل السليلوز (12.63٪) مع صنف (جيزة 126) مقارنة بالاصناف الاخرى من بذور الشعير. ومع ذلك ، تم تسجيل الزيادة المعنوية في تقدير NDF بنسبة (80.8%) مع الصنف(الجيزة 130). والقيم الغذائية التى هى التنبؤ من نتائج التحليل الكيميائي لوحظت زيادة معنوية في DCP بين بذور الشعير والاصناف المختلفة من الشعير المستنبت (العلف الاخضر) باستثناء الجيزة صنف (129) و (130). وتم تسجيل أعلى قيمة لنتائج DCP للشعير الأخضرالمستبت للأعلاف مع صنف(Giza127) زادت القيمة من 7.67٪ في البذور إلى 8.44٪ في الشعير المستنبت.وانخفض كل من DDM و DMI بشكل ملحوظ في جميع اصناف الشعير المستنبت كاعلاف خضراء المزروعة بالزراعة المائية مقارنة ببذورها. أيضا ، لاحظت فى العديد من اصناف الشعيرالمستبت كاعلف اخضر انخفاض كبير في TDN في جميع الاصناف مقارنة مع بذورها. وقياساتف قيم الطاقة التى تنتج با لتنبؤ من التحليل الكيميائي لبذور الشعير المصري والشعير المستبت للاصناف (الجيزة 128 ، الجيزة 127 ، الجيزة 130 ، الجيزة 129 ، الجيزة 126 ، وجيزة 123) ، حدث انخفاض فى كل قيم الطاقة فى الشعير المستبت بشكل ملحوظ فى طاقة النموGE)(،وطاقة الهضم (DE)، ، وطاقة التمثيل الغذائى)(MEوالطاقة الصافية (NE)والطاقة الصافية للاحتياجات الحافظة (NEM)و الطاقة الصافية لاحتياجات اللبن)(NEL فى جميع الاصناف للشعير المستبت كعلف اخضر مقارنة مع بذورها. وباستثناء أعلى معدلات النمو ، تم تسجيلها طاقة النمو مع بذور الجيزة (129) مقارنة مع اصناف الشعير الأخرى ، حيث ارتفعت القيم من 1.58 إلى 1.6 (MJ / Kg DM). تقدير معامل الهضم الظاهرى ومعامل الهضم الحقيقبواسطة طريقة In-Vitro DaisyII .،سجلت القيم في جميع اصناف الشعير المستبت كااعلاف خضراء زيادة كبيرة معنوية مقارنتا ببذورها. سجلت أعلى قيم هضمية لبذور الشعير لصنف (Giza129) مقارنة مع الاصناف الاخرى من البذور. أيضا ، أفضل قيمة (P<0.05) من قيم الشعيرالمستنبتكااعلاف خضراء مسجلة مع صنف (الجيزة 129) مقارنة مع الاصنافالأخرى (الجيزة 128 ، الجيزة 127 ، الجيزة 130 ، الجيزة 126 ، الجيزة 123). وأخيرًا ، لوحظت أفضل قيم (P<0.05) للمادة الجافة المهضومة ظاهريا المادة الجافة المهضومة حقيقيا فى الشعير المستبت كاأعلاف خضراء مع صنف (Giza129). أوضحت النتائج المتحصل عليها أن أعلى قيمة للإنتاج الاقتصادي والأرباح كانت مكتسبة من قبل الجيزة 127 والجيزة 129 والتي أعطت 39.8 و 38.3 جنيه / م 2 و 7.1 و 7.0 على التوالي مع استمرار تكاليف الإنتاج الأخرى. الاستنتاج تتم هذه العملية في وحدة تنموية مائية متعددة الاستخدامات ومكثفة للغاية ، حيث يتم استخدام الماء والمواد المغذية فقط لإنتاج تركيبة من العشب والجذور ، وهي أعلى القيم في العناصر الغذائية ، والخصائص الفيزيائية ، وتحليل هضمها ، وارتفاع نسبة البروتين والإنتاج. التكاليف. أفضل نتيجة تم تسجيلها مع إنتاج الشعير الناضج باستخدام الشعير المصري. يمكن استخدام الصنف الذهبي في شهر كانون الثاني (يناير) 2014 واضافتة في العلائق الحيوانية كعلف أخضر بالزراعة المائية في فترة قصيرة تستغرق (8 أيام - 3.5 دورة إنتاج / شهر) في أي وقت من السنة. تحت ظروف هذه التجربة ، يمكن استخدام صنف الشعير كاعلف اخضر (الجيزة 129) وذلك لاعطائة أفضل النتائج الموضحة في التنبؤ بالنظام الغذائي للحيوانات المجترة وهذه الأعلاف الخضراء المستبتة هي مناسبة للاستخدام في جميع أنواع وفئات الحيوانات.