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EFFECT OF *TRICHODERMA HARZIANUM*, ON CHEMICAL COMPOSITION AND *IN VITRO* DIGESTIBILITY OF CROP RESIDUES

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Abstract

The objective of this work was to study the effect of microbial treatment using the fungi *Trichoderma harzianum* on some crop residues (corn cops, Rice Hulls (subose), hay reed, reed, frond, wheat bran). Find the *T. harzianum* effect of and effect the treatment on chemical composition of crop residues and *In Vitro* digestion on dry matter and organic matter Which treated with two concentration T.H (1g/l and 2g/l) and three incubated periods are (0, 20, 30) Day. The results showed different effects among treatment as follow: high significant increase ($p<0.01$) in dry matter when treated corn cops with fungus *T. harzianum* while a high significant increase ($p<0.01$) found in organic matter, crude protein and *In Vitro* digestibility of dry matter and organic matter. The results showed the highest increase ($p<0.01$) in crud fiber when treated subose with *T. harzianum* when comparison between the concentration of fungi found high significant increase ($p<0.01$) in the amount of dry matter, organic matter and crud protein when treated with 2 gm *T. harzianum*/L compared with 1gm/L, while showed high significant increase ($p<0.01$) in the crud fiber when treated feed with 1gm fungi/L compared with 2gm /L. The variation of the period of incubation on the chemical composition as follows as: The best high significant increase ($p<0.01$) was obtained during the incubation period of 30 day in dry matter, crud fiber and *In Vitro* digestion on dry matter and organic matter.while the best significant increase in the incubation of the 20-day period.

The results of the interaction between the concentration of the fungus and the type of material obtained high quality improvement ($P<0.01$) in the quantity of organic and dry matter, crud protein, crud fiber and the *In Vitro* digestion of dry and organic matter showed the results of the interaction between the type of material and the period of incubation, $p<0.01$) in all studied traits. The results indicated that the interaction between the concentration of fungus and the incubation period showed a significant improvement ($P<0.01$) in the quantity of dry matter and its ratio of protein, while there was no significant effect in the quantity of organic matter, *In Vitro* digestion For dry and organic matter. The results of the interaction between the type of material and the concentration of fungus and incubation period was high significant ($p<0.01$) in all attributes

Key words : *Trichoderma harzianum*, Rice Hulls (subose), *In Vitro* digestion.

Introduction

Nutrition is the main factor in increasing production. The success of fattening depends largely on the availability, quality and cost of feed. Most of the raw materials are high in fiber content and low in protein content and energy (Ibrahim, 2002). The importance of fiber in stimulating the secretion of saliva will contribute to the process of fermentation in the rumen and 35 _15% of the energy consumed turn into a net energy because of the incomplete digestion of fiber in the area of rumen and due to the low grazing areas and the preparation of animals in Iraq (Saadi, 2009) To find alternatives to get rid of these problems and reduce costs through the use of fodder biologically treated because of low price and high food value through the treatment (Al-Samraee, 2006; Hassan *et al.,* 2008) researchers resorted to the use of different microorganisms (fungi and bacteria) to choose the best to give Best to improve the value of food to feed (Mohini and mahesh, 2013; Al-Waeli, 2013)

The fungus *T. harzianum* is a fungus that works to break the bonds between the walls of the building cells of the plant so that the decomposition of an important part of the equivalent of some feed fermented mushroom (T, h) and its effect on chemical composition and *In Vitro* digestion.

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Table 1: The main effect of the difference in the substrate of the treatment The effect of fungus in the chemical composition and *In Vitro* digestion.

Item	TH Concentrations		Sign.
	1 g/l	2 g/l	
DM	95.14 ± 0.44b	95.83 ± 0.29 a	**
OM	85.27 ± 0.82b	85.95 ± 0.83 a	**
CP (%)	7.08 ± 0.59b	8.37 ± 0.66a	**
CF	30.87 ± 1.91a	28.35 ± 1.76b	**
DDM (%)	51.55 ± 2.73 b	55.79 ± 2.69 a	**
DOM (%)	55.19 ± 2.60b	59.63 ± 2.61a	**

**=significant (p<0.01).

Materials and Methods

The research was conducted at the Faculty of Agriculture, University of Baghdad used six type of roughages (corn cops, Rice Hulls (subose), hay reed, reed, frond, wheat bran) (1g/L) and (2g/L) and incubated at three intervals t.h 20.0 and 30 days Mushrooms were obtained from the Department of Plant Protection /Faculty of Agriculture/University of Baghdad

The whole material was divided into 6 groups and the fungus was dissolved at a concentration of 1g /lit. It was sprayed on half of the syrup and sprayed on the second half. The dissolved mushrooms were concentrated at 2g/L water. And incubated on three incubation periods (20.0 and 30) days and at the end of each period the material is extracted and dried and kept in plastic bottles and processed until the conduct of chemical analysis and then estimate the amount of dry matter and organic matter, crud fiber and crud protein (A.O.A.C 2005) and *In Vitro* digestion dry and organic matter (Terry and Tilley, 1963)

Table 2: Effect of fungus Concentration on Chemical Composition and Laboratory Metabolomics for Processed Feed.

Item	Corn cob	Rice husks	Reed hay	Reeds	Palm leaves	Wheat bran	sign
DM	96.87±0.31a	96.10±0.31cb	94.13 ± 1.03D	96.49 ± 0.53ab	95.67±0.27 c	93.65± 0.63 d	**
OM	87.58±1.65ab	77.42 ± 0.65e	86.20± 1.23D	87.54 ± 0.54b	87.17 ± 0.59c	87.77±0.53a	**
CP (%)	4.85± 0.55f	8.16±0.22c	8.87 ±0.30B	5.13± 0.68e	5.50 ± 0.91d	13.84±0.78a	**
CF	20.74± 0.49e	41.92 ± 0.67a	33.80±1.04C	30.51 ± 0.45d	38.97 ± 1.82b	11.71± 0.44f	**
DDM (%)	40.88 ±1.27d	40.78±1.20f	60.07± 0.41B	52.78 ± 2.15c	38.38±2.31e	76.23± 0.96a	**
DOM (%)	44.57±1.31d	43.00±2.03f	63.46± 0.40B	56.85 ±2.25c	e±2.05 43.08	79.10 ±0.79a	**

**=significant (p<0.01).

Table 3: The effect of different incubation periods for fungus –treated fungi on chemical composition and *In Vitro* digestion for dry and organic matter.

Item	Incubation period (day)			Sign.
	0	20	30	
DM	94.42 ± 0.36c	95.54 ± 0.27 b	96.49 ± 0.61 a	**
OM	85.34 ± 1.10 b	86.27± 0.88a	85.22 ± 1.05b	**
CP (%)	5.45 ± 0.67c	8.38 ± 0.75b	9.34 ± 0.69a	**
CF	30.96 ± 2.38 a	29.63 ± 2.26 b	28.23 ± 2.16 c	**
DDM (%)	48.71 ± 3.48c	54.55 ± 3.36 b	57.75 ± 2.96 a	**
DOM (%)	53.04 ± 3.39c	58.07 ± 3.19 b	61.12 ± 2.90a	**

**=significant (p<0.01).

Table 4: The effect of the interaction between the type of substance and concentration of feed fungus treatment on the chemical composition of plants digestion laboratory Drying and organic.

Item	Types of Roughages												Sign.
	Corn cob		Rice husks		Reed hay		Reeds		Palm leaves		Wheat bran		
	1g/ lConc.	2g/ lConc.	1g/ lConc.	2g/ lConc.	1g/ lConc.	2g/ lConc.	1g/ lConc.	2g/ lConc.	1g/ lConc.	2g/ lConc.	1g/ lConc.	2g/ lConc.	**
DM	96.98± 0.40a	96.76± 0.50A	95.71± 0.15Abc	96.49± 0.58a	92.09 ± 1.64D	96.17 ± 0.54Ab	96.87 ± 0.81a	96.11 ± 0.71ab	95.64 ± 0.41 abc	95.70 ± 0.4abc	93.56± 0.91cd	93.75± 0.95cd	**
OM	88.40± 2.41A	86.75± 2.44A	77.46± 0.96B	77.39± 0.96b	84.63 ± 2.02A	87.76 ± 1.28a	87.41 ± 0.65a	87.66 ± 0.92a	87.04 ± 0.77 a	87.29± 0.96A	86.70 ± 0.20a	88.83± 0.85a	**
CP (%)	4.16± 0.43D	5.54± 0.97Dc	7.81± 0.12Bc	8.50± 0.39b	8.55 ± 0.32B	9.19± 0.51B	4.47± 0.71d	5.79± 1.15dc	4.35 ± 0.75D	6.66± 1.59Dc	13.15 ± 0.87a	14.53± 1.31a	**
CF	21.46± 0.41E	20.03± 0.83E	43.46± 1.00A	40.38 ± 0.14a	34.36 ± 0.34Bc	33.24 ± 2.13Bcd	31.08 ± 0.40dc	29.94 ± 0.77d	42.69 ± 0.90 a	35.24 ± 2.87b	12.14 ± 0.60f	11.27± 0.63f	**
DDM (%)	39.14± 0.81De	42.63± 2.28D	42.50± 2.18F	40.49± 2.19g	59.32 ± 0.30b	60.83 ± 0.65b	48.80 ± 1.02c	56.76± 3.60b	35.39 ± 2.37E	41.37 ± 3.77De	75.09 ± 0.91 a	77.37± 1.64a	**
DOM (%)	42.58± 0.58D	46.56± 2.36D	45.45± 2.20E	40.38± 2.15f	62.79 ± 0.24B	64.12 ± 0.68B	52.14 ± 0.61c	61.56 ± 3.62b	40.67 ± 2.33 d	45.49± 3.28D	77.78 ± 0.47a	80.41 ± 1.36a	**

Results and Discussion

Table 1 showed that the difference in the type of feed substrate affected the effect of the fungus, where it obtained a significant increase P<0.01 When using the seeds of corn and reeds in the quantity of dry matter and organic matter, while observed when using the spouses got a high significant increase P<0.01. In the quantity of fiber also got a high moral increase in the amount of dry matter when using reeds and at the same time we note a high significant increase(p<0.01). In both the organic matter and the proportion of protein and the digestion factor dry matter and organic matter This difference in the improvement in nutritional value may be due to the nature of the material.

The results of table 2 indicate that the difference in the concentration of fungus used has increased significantly (P<0.01). When using 2g in the quantity of dry matter and organic matter and the proportion of protein compared with the concentration of the first 1 g/l, while the results indicated a significant increase (P<0.01). When using the first concentration in crud fiber compared with the second concentration.

The results of table 3 showed that when incubation periods differed, there was a significant increase in both dry matter, protein ratio, and digestion ratio (P<0.01) Laboratory for the dry and organic period at the incubation period 30 days while the incubation period 20 days significantly better in increasing the amount of organic matter.

Results show in Table 4 the effect of the overlap between the type of feedstuff and the concentration of fungus resulted in a high quality improvement (P<0.01). In the amount of dry matter and organic matter when the overlap between the use of calorie and the concentration of fungi while gaining a high moral increase (P<0.01) When the overlap between the Subose and the concentration of fungus while gaining a high moral (P<0.01) When the overlap between the reeds and the concentration of the second fungus in the amount of dry matter and improve the high moral in the amount of organic matter and got a high moral increase (P<0.01) When the reeds and palm fronds overlap with the concentration of the fungus in the quantity of dry and organic matter. The results of table 4 indicate a significant increase in organic matter, crude protein ratio, and laboratory digestibility ratio of dry and organic matter, when the mixture between the wheat and the concentration of the fungi was 2.1g/L.

Results in table 5 showed the effect of interaction between the type of feed material and the period of

Table 5: Effect of interaction between the type of material and the period of incubation of the treatment of the chemical composition and laboratory digestion laboratories for dry organic matter.

Items	Types of Roughages																		Sign.
	Corn cob			Rice husks			Reed hay			Reeds			Palm leaves			Wheat bran			
	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	
DM	96.12± 0.11abc	96.23± 0.24Abc	98.26± 0.0Ab	95.50± 0.01C	95.89± 0.15bc	96.91± 0.82abc	95.02± 0.01cd	94.65± 1.37cd	92.72± 2.96De	94.51± 0.18cd	96.39± 0.47abc	98.57± 0.18 a	94.62± 0.01 cd	95.57± 0.06c	96.83± 0.01abc	90.78± 0.02e	94.53± 0.15cd	95.65± 0.01 bc	**
OM	90.42± 0.11ab	92.26± 0.88a	80.05± 0.65f	74.56± 0.02g	78.81± 0.53f	78.91± 0.47f	90.26± 0.03ab	84.08± 0.22e	84.25± 2.91e	85.70± 0.06de	87.03± 0.13 cd	89.87± 0.35ab	84.94± 0.07de	86.94± 0.08 cd	89.62± 0.29b	86.19± 0.01cde	88.49± 0.69bc	88.62± 1.16 bc	**
CP (%)	2.79± 0.01h	5.32± 0.25g	6.43± 0.95fg	7.51± 0.01 def	8.15± 0.29cde	8.83± 0.41cde	7.58± 0.01def	9.31± 0.29bc	9.27± 0.27Bc	2.23± 0.01h	6.21± 0.41fg	6.95± 0.74 efg	2.21± 0.35h	5.73± 0.67g	8.58± 1.33cde	10.42± 0.01d	15.58± 0.42a	15.53± 0.78a	**
CF	22.58± 0.14f	20.29± 0.65f	19.37± 0.61f	40.80± 0.01Ab	41.79± 0.88a	43.17± 1.78a	35.29± 0.01cd	36.08± 0.99cd	30.03± 1.96e	32.32± 0.01de	29.97± 0.4e	29.26± 0.55 e	44.27± 0.01 a	37.73± 3.59 bc	34.90± 2.86cd	10.53± 0.02g	11.93± 1.10 g	12.66± 0.34 g	**
DDM (%)	36.59± 0.04f	41.26± 0.57Ef	44.80± 2.46e	43.70± 2.18j	43.80± 2.20i	43.13± 1.75h	58.79± 0.02cd	60.27± 0.79cd	61.17± 0.52C	45.61± 0.01e	55.12± 2.98d	57.61± 3.90cd	30.33± 0g	38.31± 297f	46.51± 2.48e	72.23± 0.01b	77.82± 0.86a	78.65± 1.11a	**
DOM (%)	40.82± 0ef	44.45± 0.51Cde	48.44± 2.97Cd	32.28± 0.01i	33.28± 0.01h	34.28± 0.01g	62.2± 0.06b	63.43± 0.43b	64.72± 0.71b	50.31± 0c	59.42± 3.4b	60.83± 4.75b	35.54± 0.01f	43.28± 2.67be	50.41± 1.51a	76.33± 0.01a	79.75± 0.88a	81.22± 1.39a	**

**=significant (p<0.01).

Table 6: Effect of overlap between the type of material and the concentration of fungus and incubation period of the treatment on the focus.

Items	1g/l			2g/l			Sign.
	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	
DM	94.42±0.52B	95.55±0.53B	95.45±1.12b	94.42±0.52b	95.53±0.11B	97.53±0.30A	**
OM	85.34±1.59	86.58±1.26	83.89±1.39	85.34±1.59	85.95±1.28	86.55±1.53	NS
CP(%)	5.45±0.96b	7.73±1.06Ab	8.05±0.94ab	5.45±0.96b	9.03±1.06a	10.63±0.90A	**
CF	30.96±3.44	31.27±3.30	30.37±3.45	30.96±3.44	27.99±3.16	26.09±2.59	NS
DDM(%)	48.71±5.05	51.82±5.01	54.12±4.44	48.71±5.05	57.29±4.58	61.37±3.78	NS
DOM(%)	53.71±5.05	55.34±4.71	5.20±4.24	53.04±4.92	60.80±4.37	65.05±3.77	NS

**=significant (p<0.01) ns =no significant.

incubation. Where it got a very high moral (P<0.01) (30, 20, 0) while the increase in spousal nesting during the incubation period of 30 days in the quantity of dry material and in the quantity of fiber at the incubation periods (20, 30) days while the increase in morale when the rotation of cane with Period of bosom (0). A day in the amount of organic material and the results indicated a significant increase (P<0.01) (30, 20) days were significantly higher in the amount of dry matter when the reeds overlap with the incubation periods (30, 20) days and were significantly better in the quantity of fiber and the overlap of the wheat bran with the incubation period (30, 20, 0) (P<0.01). In the proportion of digestion factor dry matter and organic matter.

The results showed table 6 the effect of the interaction between the concentration of the fungus and the period of incubation A significant increase in morale (P<0.01) (2 g/l) with the incubation period of 30 days while no significant difference in the amount of organic matter and the quantity of fiber and its relation to laboratory digestion factor of the dry and organic matter also got a high superiority in the percentage of crude protein at the overlap of the first pillar (1g/l) at incubation periods (20, 30 days).

The results of table 7 indicated that the effect of triple interference between the type of feed material and incubation period and the concentration of fungi had a significant effect (P<0.01) And the best treatment when the overlap of the calorie and followed by the reeds of the reeds at the second concentration and the period of the spinus and reeds with the first and second focus at a period of lap 30 days 30 days in the amount of dry matter, while the organic material was the best increase in high morale when the correlation of the calorie with the first concentration and a period of incubation of 20 days and was the best increase in the proportion of crude protein at the treatment of wheat bran at the concentration of (2g/l) at the lap period (20, 30 days). When the mixture of wheat bran with concentration (2g/L) at 30-day incubation period affected significantly, there was a significant decrease in morale (p<0.01) In the crude fiber quantity followed by the first concentration of the period of lap 20 days to drain the wheat. And the effect of triple interference on the highly digestible laboratory digestion factor (P<0.01) When the mixture is mixed with the second concentration (2g/l) in the incubation period (30 and 20 days).

A study showed that biological treatments with fungi T.H Has led to a high quantity of dry matter and extract of ether and ash and its ratio of crude protein while decreasing the amount of organic matter and raw fiber and change the composition of the chemical result of the treatment of biological fungi *T. reesei* In terms of increasing the raw protein and reducing the raw fiber content that may be behind the improvement of digestion and nutritional value (Salman *et al.,* 2011).

This improvement can also be attributed to the digestion of raw fiber as a result of biological parameters to the enzyme activity of fungi that can be responsible for the gradual degradation of cellulose to glucose (Gado *et al*., 2007 and Abdel-azim *et al.*, 2011) That the innate treatment of the rabbit led to an increase in the content of the crude protein and the results were not consistent with what he found Abo-Donia *et al*., (2005).

The low fiber content may be related to the utilization of carbohydrates as a source of energy for fungal growth. It has been shown that the biological treatment has led to a decrease in the contents of the organic matter and the raw fiber while the high content of crude protein and ash compared with the Non-processed feed (Zewil, 2010).

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Table 7: The interaction between the fungus concentration and the incubation period of the treatment of the fungus on the chemical composition and the laboratory digestion coefficient of dry and organic matter.

Items	Types of Roughages																	
	Corn cob						Rice husks						Reed hay					
	g/l1Conc.			2g/lConc.			g/l1Conc.			2g/lConc.			g/l1Conc.			2g/lConc.		
	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)
DM	96.12± 0.19cde	96.62± 0.10cde	98.20± 0.10cde	96.12± 0.19cde	95.85± 0.18Cdef	98.32± 0.12Ab	95.50± 0.01Cdef	96.11± 0.1cde	95.51± 0.25Cdef	95.50± 0.01bc	95.66± 0.14cdef	98.32± 0.12ab	95.02± 0.02defg	93.65± 3.05g	87.60± 0.02i	95.02± 0.02defg	95.66± 0.04cdef	97.84± 0.04ab
OM	90.42± 0.19bc	93.75± 0.13a	81.03± 0.21n	90.42± 0.19bc	90.77± 0.44b	79.08± 0.75p	74.56± 0.04r	79.72± 0.02o	78.10± 0.1q	74.56± 0.04r	77.90± 0.1q	79.72± 0.09o	90.26± 0.05bc	84.41± 0.08l	79.22± 0.02op	90.26± 0.05bc	83.75± 0.26m	89.29± 0.04ef
CP(%)	2.79± 0.02r	4.90± 0.08p	4.78± 0.1pq	2.79± 0.02r	5.74± 0.07o	8.08± 0.14k	7.51± 0.01l	7.77± 0.04l	8.15± 0.15K	7.51± 0.01l	8.50± 0.50j	9.51± 0.30h	7.58± 0.031l	8.81± 0.01i	9.26± 0.05h	7.58± 0.03l	9.81± 0.01g	10.18± 0.03f
CF	22.58± 0.25t	21.41± 0.21u	20.41± 0.21v	22.58± 0.25T	19.18± 0.17w	18.32± 0.02x	40.80± 0.01e	43.32± 0.02d	46.26± 0.05a	40.80± 0.01e	40.26± 0.05f	40.09± 0.01fg	35.29± 0.02 i	34.37± 0.07j	33.43± 0.03 K	35.29± 0.02i	37.78± 0.08h	26.64± 0.04s
DDM (%)	36.59± 0.07m	40.28± 0.06i	40.55± 0.25i	36.59± 0.07m	42.24± 0.02k	49.05± 0.24i	37.28± 0.03j	38.28± 0.04j	39.28± 0.05j	20.28± 0.07k	21.28± 0.07k	22.28± 0.07k	58.79± 0.04g	58.91± 0.01g	60.28± 0.03fg	58.79± 0.04fg	61.63± 0.03ef	62.06± 0.05e
DOM (%)	40.82± 0.01u	43.62± 0.41s	0.31± 0.31t	40.82± 0.01u	45.29± 0.04r	53.58± 0.03m	52.28± 0.07o	52.30± 0.08o	52.31± 0.09o	52.94± 0.09n	52.55± 0.06n	53.30± 0.09n	62.23± 0.11l	62.66± 0.03k	63.49± 0.01j	62.23± 0.01j	64.21± 0.01i	65.94± 0.04g

Supplement the (Table 7).

Items	Types of Roughages																		Sign.
	Reeds						Palm leaves						Wheat bran						
	g/l1Conc.			2g/lConc.			g/l1Conc.			g/l1Conc.			2g/lConc.			g/l1Conc.			
	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	0 (d)	20 (d)	30 (d)	
DM	94.51± 0.31efg	97.21± 0.02abc	98.89± 0.01a	94.51± 0.01Efg	95.58± 0.03cdef	98.26± 0.05ab	94.62± 0.02efg	95.47± 0.01cdef	96.85± 0.02bc	94.67± 0.02Efg	95.67± 0.01cdef	96.82± 0.02bc	90.78± 0.03h	94.26± 0.04fg	95.64± 0.03Cdef	90.78± 0.03h	94.79± 0.01efg	95.67± 0.01cdef	**
OM	85.70± 0.10J	87.26± 0.04g	89.26± 0.06ef	85.70± 0.10J	86.81± 0.01m	90.49± 0.02bc	84.94± 0.01k	87.07± 0.03gh	89.13± 0.03f	84.94± 0.01K	86.81± 0.01gh	90.12± 0.01cd	86.19± 0.02ij	87.30± 0.02g	86.62± 0.02hi	86.19± 0.02Ij	89.69± 0.03ed	90.62± 0.02bc	**
CP (%)	2.23± 0.03s	5.51± 0.01o	5.67± 0.01S	2.23± 0.03S	6.92± 0.01h	8.23± 0.03jk	2.21± 0.01s	4.57± 0.02q	6.27± 0.03n	2.21± 0.01S	6.90± 0.01h	10.89± 0.01e	10.42± 0.02f	14.85± 0.04c	14.18± 0.03d	10.42± 0.02f	16.31± 0.02b	16.88± 0.02a	**
CF	32.32± 0.02i	30.73± 0.01n	30.21± 0.01O	32.32± 0.02I	29.21± 0.01q	28.31± 0.01r	44.27± 0.01b	43.95± 0.01c	39.86± 0.01g	44.27± 0.01b	31.51± 0.01m	29.94± 0.04p	10.53± 0.03b	13.83± 0.03y	12.07± 0.06a	10.53± 0.03b	10.03± 0.03c	13.26± 0.05z	**
DDM (%)	45.61± 0.01J	49.95± 0.03Hi	50.85± 0.01H	45.61± 0.01j	60.29± 0.01fg	64.37± 0.01d	30.33± 0.01o	33.63± 3.00n	42.21± 0.01k	30.33± 0.01	42.99± 0.01k	50.80± 0.02h	72.23± 0.03c	76.33± 0.03B	76.73± 0.03b	72.23± 0.03c	79.32± 0.01a	80.58± 0.03a	**
DOM (%)	50.31± 0.01P	53.54± 0.02o	52.59± 0.01M	50.31± 0.01P	65.31± 0.01h	69.06± 0.04f	35.54± 0.01w	38.65± 0.01v	47.81± 0.01Q	35.54± 0.01W	47.81± 0.01w	53.02± 0.01n	76.33± 0.03e	78.22± 0.02D	78.81± 0.02c	76.33± 0.03e	81.28± 0.03e	83.63± 0.03a	**

**=significant ($p<0.01$).

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