EFFICACY OF DIFFERENT LEVELS OF DRIED DISTILLER'S GRAINSWITH SOLUBLES AS A REPLACEMENT FOR SOYBEAN MEAL AND PORTION OF THE CORN IN A GROWING AND FINISHING BAFFALO CALVES DIET

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SUMMARY

Eighty growing buffalo calves, 14-16 months old, with an average weight of 202 kg, were divided, randomly, into four equal experimental groups, (20 calves each), and used to investigate the effect of replacing 0%, 10%, 20% and 30% of soybean and yellow corn by dried distiller's grains with soluble (DDGS) in total mixed rations (TMR) (1,2,3 and 4, respectively). The experimental diets were nearly similar in crude protein (CP) (iso-nitrogenous) and total digestible nutrients (TDN) (iso-caloric). All animals were fed daily 3% of live body weight and the trial lasted for 180 days. Metabolism trials were carried out on three mature rams for each TMR to estimate nutrient digestibilities, nutritive values and nitrogen balance. The economic efficiency was also calculated. Significantly lower values of live body weight and daily gain were recorded for calves fed the control diet (TMRI). Significantly best values were achieved by calves fed the 30% followed by 20% dietary DDGS instead of soybean meal and yellow corn. Results of digestibility trials indicated that rams fed the control diet (TMRI) had significantly ($P<0.05$) lower digestibility coefficients, nutritive values and nitrogen utilization compared with other diets. No significant differences were observed ($P<0.05$) among the experimental groups in ruminal pH and the obtained values were within the normal ranges (6.70-6.84). Ammonia–N concentration was greater in control diet but, there was a linear decrease in ammonia–N concentration as the level of DDGS increased in the diets. Supplemented rations with DDGS showed significant increase in the level of TVFA's. Increasing level of DDGS in diets of calves' increased TP concentrations, being the lowest in TMRI (control), while albumin and globulin recorded insignificant differences among all diets. The values of AST were higher significantly ($P<0.05$) in rations containing DDGS than that of control. Values of serum- creatinine and cholesterol were not affected by dietary treatments. Blood parameters studied indicated normal physiological and healthy status of all experimental calves. Total body gain and daily gain were increased quadratically ($P<0.05$) with increasing DDGS replacement. Calves fed diets containing 20% or 30% DDGS recorded the best feed conversion values followed by 20% DDGS.

It may be concluded that inclusion of DDGS with a rate of 30% from soybean meal and yellow corn in buffalo calves diet result in better net revenue, economical efficiency and feed cost per kg daily gain.

Keywords: *DDGS, digestibility, nutritive values, nitrogen utilization, rumen fermentation, growth performance and economic efficiency.*

INTRODUCTION

Starch in grains, during processing, is converted into ethanol and carbon dioxide. The rest of the grain constituents are: proteins, lipids, minerals and vitamins. These compounds, relatively are unchargeable chemically, but concentrated approximately in threefold, (Spiehs *et al.*, 2002). Distiller's grains are considered to be good source of energy and protein for ruminants (Warner, 1970). They are low in lignin and starch, and high in digestible natural fiber compared to original corn grains as reported by Gilbery *et al.* (2004). They contain other nutrients recovered from fermented grains. These include low soluble carbohydrates, relatively high fiber, high fat, and a factor stimulating cellulose digestion in the rumen (Hach, 1993).

Feeding DDGS supply animals with both crude proteins and energy. Liu *et al.* (2006) reported that DDGS contains are considered valuable source of supplemental proteins with high rumen undegradable 47% of crude protein (bypass protein) as compared to 35% in soybean meal. Kleinschmit *et al.* (2006)

proposed that by-pass protein is necessary for maximal production by young growing ruminants and high producing dairy cows. It may be due to escape protein value improving the protein status of animal resulting in superior performance or improved rumen fermentation which results in better utilization of feedstuffs (Stein and Shurson, 2009).

Powers *et al.* (1995), reported that DDGS as proteins source are often more economical than soybean meal or other oilseed meals. Sheep can be fed on greater concentration of DDGS, (Schower *et al.,* 2008), without affecting animal performance. Huls *et al.* (2006) reported that DDGS can be used up to 22.5% of fattening ration with no negative effect on performance.

The objectives of the current study were to determine the effects of partial replacement (10, 20 and 30%) of soybean meal and portion of yellow corn by DDGS on DM intake, digestion coefficients, rumen and blood parameters and growth performance, economic efficiency of growing and finishing buffalo calves.

MATERIALS AND METHODS

The experiment was carried out at Toukh Feedlot Station, kalyobia governorate and Regional Center for Food and Feed (RCFF), Agricultural Research Center, Ministry of Agriculture.

Eighty buffalo calves of 14-16 months age, with an average initial live body weight of 202 kg, were divided into four similar groups in live body weight and age (20 animals each). Buffalo's body weights were recorded at the beginning of the experimental and morning before feeding every month thereafter, till the end of the trial that lasted for 180 days. Each group was kept in separate shaded pen.

Experimental diets:

Four iso-nitrogenous and iso-caloric, total mixed rations (TMR) were formulated. One of the TMR served as control and three were formulated to contain 0, 20 and 30% DDGS in place of 0, 33, 66 and 100% of soybean meal and 0, 12.5, 25 and 37.5% from yellow corn. Composition of tested rations are presented in Table (1). The animals were randomly assigned to receive one of the four TMR. All animals were fed 3% of body live weight TMR in two equal meals, twice daily (8.00 am and 3.00 pm). Fresh water and salt blocks were available for each group throughout all the day.

Table (1). Feed ingredients of the experimental total mixed rations (TMR) on dry matter basis.

Feed ingredients, %	Control TMR 1	10% DDGs TMR2	20% DDGS TMR3	30% DDGS TMR4
Yellow corn	40.0	35.0	30.0	25.0
Soybean meal (44%)	15.0	10.0	5.0	0.0
Wheat bran	7.0	7.0	7.0	7.0
Dried distiller grains with soluble	-	10.0	20.0	30.0
Berseem hay	30.0	30.0	30.0	30.0
Molasses	5.0	5.0	5.0	5.0
Lime stone	1.5	1.5	1.5	1.5
Salt	1.0	1.0	1.0	1.0
Mineral premix	0.5	0.5	0.5	0.5

Metabolizable trials:

Four metabolizable trials were carried out, to evaluate the experimental rations, using three mature Rahmany rams, aged 28 months and weighing 60 kg live weight, for each diet. The animals in each trial, were fed individually in metabolic cages on one of the 4th TMR rations to provide animals with their maintenance requirements of mature sheep according to NRC (1985).

Each trial lasted 31 days (21 days as preliminary period, followed by 10 days as collection period), during the collection period feces and urine were collected daily. One tenth of daily feces and excreted urine were taken. Urine samples were stored in tight bottles containing sulphuric acid (1:1) to capture NH_3 nitrogen.

The collected feces (10 days collection) of each animal was well mixed and then dried at 60°C for 48 hours. Samples were taken for determination of dry matter. The remaining feces were ground for proximate chemical analysis.

The representative samples of different TMR, feces and urine were chemically analyzed according to the official of A.O.A.C. (1995) methods. Fiber constituents: neutral detergent fiber (NDF) was determined, according to Van Soest and Marcus (1964). Acid detergent fiber (ADF) and acid detergent lignin (ADL) were determined by Robertson and Van Soest procedures (1981). Non fibrous carbohydrates were calculated according to Calsamiglia *et al.* (1995).

Rumen liquor parameters:

After the end of each metabolism trial, rumen liquor samples were taken from the animals through stomach tube. Samples were taken just before morning feeding, then at 2, 4 and 6 hours, post feeding. Collected rumen liquor samples were directly tested for pH using Orian 680 digital pH meter. Samples were strained through four layers of cheese cloth for each sampling time to get clear liquid. Ammonia nitrogen (NH_3 - N), was determined using magnesium oxide (MgO), as described by AL- Rabbat *et al.* (1971). Total volatile fatty acids (VFA'S) concentrations were estimated, using steam distillation methods (Warner, 1964).

Blood parameters:

At the end of growth trials, blood samples were collected from the Jugular vein of randomly 3 animals, for each treatment at zero time before morning feeding in heparinized test tube. The blood plasma was obtained by centrifuging the blood samples soon after collection at 4000 rpm, for 15 minutes. Blood plasma was transferred into a clean dried glass vials, then stored in deep freezer at – 20°C, for subsequent specific chemical analysis. Total protein was determined as described by the method of Weichselbaum (1989) and albumin according to Doumas *et al.* (1971). Globulin concentration was calculated as the difference between serum total protein and albumin. Serum creatinine was conducted according to Bartels (1971). Aspartate aminotransferase (AST) and alanine aminotransferase (ALT), were determined as described by Reitman and Frankel (1957). Cholesterol (mg/ 100 ml plasma) was determined according to Trinder (1969). Plasma triglycerides were determined according to the method of Fossati and Prencipe (1982).

Statistical Analysis:

Data was statistically analyzed using SAS (2003): When F-test was positive, the differences between means were determined according to Duncan (1955).

RESULTS AND DISCUSSION

Evaluation of DDGS and the experimental TMR:

The chemical composition of DDGS and the four TMR (table 2) indicated that DDGS contained 26.93% crude protein (CP), 9.88% ether extract (EE), 10.74% crude fiber (CF), 4.58% ash and 47.87% nitrogen free extract (NFE), the crude protein value of DDGS was close to that reported by Choi *et al.* (2008), being 27.53 and lower than that recorded by Spiehs *et al.* (2002), being 30%, ether extract value of DDGS was almost similar to that reported by NRC (2000).

Such differences could be mainly due to processing technological conditions, crude fiber content (CF) of DDGS was higher than that reported by Lumpkins *et al.* (2004). Also NDF content of DDGS was 37.78%, in agreement with that of Spiehs *et al.* (2002) who reported that NDF of DDGS ranged between 37 to 48%. The present result led to decreasing NDF and hemicellulose linearly with increasing DDGS in the diet.

The chemical composition of the experimental rations showed approximate values except TMR1, which had the lowest CF and highest NFE contents compared to the other rations. These results may be attributed to the high CF and low NFE content of DDGS, when compared with yellow corn and soybean meal. The non-fibrous carbohydrates (NFC) ranged from 39.28–41.68% in the present experimental rations. The values are more close to the values obtained by Calsamiglia *et al.* (1995), who stated that rations formulated for 35 to 42% NFC (DM basis), should avoid metabolic disturbances related to feeding high levels of starches in grains.

Digestibility coefficient and nutritive values:

The nutrients digestibility coefficients and nutritive values of experimental rations are represented in Table 3. Dry matter (DM) and organic matter (OM) digestibilities were lowest ($P < 0.05$) for control ration than other diets. These results are in contrast with those obtained by Pavan *et al.* (2007), who reported that a linear decrease in apparent total tract digestibility of DM and OM in response to increasing DDGS supplementation in rations for steers. Higher digestion coefficient of CP was obtained ($P< 0.05$), for ration 3 and 4, followed by ration 2 and then control one with significant differences among the four

treatments. These results are in harmony with those obtained with leupp *et al.* (2012), who found that total tract CP digestion was increased with increasing DDGS in the diet. In the present study, as dietary DDGS inclusion rates, CF content was also increased for diet containing 10, 20 and 30% DDGS. Accordingly this leads to improvement in CF digestibility. The highly digestible fiber in corn DDGS allows it to serve as a partial replacement for forages and concentrates in diets for beef cattle. The present results in Table 3, indicated that nutritive values as TDN and DCP were increased significantly (P<0.05) with animals fed rations containing DDGS. Moreover, animals fed on control rations recorded the lowest value (P< 0.05).

Generally, adding DDGS at a level of 30% increased digestibility coefficients and nutritive values of these rations. Therefore, DDGS may be used successfully up to 30% of the content of the diet. These results are in agreement with t

Table (2). Chemical composition and fiber fractions of DDGS and experimental TMR's (on dry matter basis).

Composition of DM %	TMR1	TMR2	TMR3	TMR4	DDGS
Dry matter (DM)	89.51	89.33	89.15	89.41	89.67
Organic matter(DM)	94.22	94.17	94.12	94.07	95.42
Crude protein (CP)	14.05	14.10	14.20	14.25	26.93
Crude fiber (CF)	9.78	10.33	11.30	11.82	10.74
Ether extract (EE)	2.98	3.05	3.19	3.24	9.88
Nitrogen free extract (NFE)	67.41	66.69	65.43	64.76	47.87
Ash	5.78	5.83	5.88	5.93	4.58
Fiber fractions %					
NDF	37.91	37.12	35.17	34.90	37.78
ADF	22.04	24.18	22.49	21.80	19.33
ADL	2.92	4.75	4.05	3.75	3.23
Hemicellulose	15.87	12.94	12.68	13.10	18.45
Cellulose	19.12	19.43	18.44	18.05	16.10
NFC*	39.28	39.90	41.56	41.68	

**Non fibrous carbohydrates % = OM % - (CP% + NDF% + EE %) according to Calsamiglia et al, (1995).*

hose reported by O'Shea *et al.* (2009).

Table (3). Effect of feeding the experimental rations on digestibility coefficients and nutritive values with sheep.

Item	R1	R2	R3	R4
Digestibility coefficients %				
DM	66.11 ^{b}	66.96 ^{b}	69.25 ^{a}	68.16 ^{a}
OM	67.96 ^{b}	70.21 ^{a}	71.19 ^{a}	70.05 ^{a}
CP	66.44 ^{d}	68.36 ^{c}	70.52 ^{a}	69.18 ^{b}
CF	61.51 ^{c}	62.33 ^{b}	63.18 ^{a}	62.92 ^{ab}
EE	77.65 ^{b}	77.72 ^{b}	79.20 ^{a}	79.15 ^{a}
NFE	71.94 ^{d}	73.47 ^{c}	74.08 ^{b}	75.11 ^{a}
Nutritive values				
TDN	69.15 ^{c}	70.41 ^{b}	71.31 ^{a}	71.71 ^{a}
DCP	9.33 ^{c}	9.64 ^{b}	10.01 ^{a}	9.86 ^{ab}
TDN : DCP	7.41 ^{a}	7.30 ^{b}	7.12 ^{c}	7.27 ^{b}
DM, TDN and CP intake (g/h/d)				
DM	1050.3 ^{d}	1063.6 ^{c}	1100.2 ^{a}	1082.9 ^{b}
TDN	726.3 ^{c}	749.0 ^{b}	784.6 ^{a}	776.6 ^{a}
CP	147.6	150.0	157.2	154.3

a, b, c and d : in the same row with different superscripts are significantly different (P< 0.05).

Results concerning nitrogen intake, excretion and nitrogen balance are presented in Table (4). The data indicate no significant differences (P < 0.05) in the daily nitrogen intake (N1) between control and diet containing 10% DDGS, while diets containing DDGS 20 and 30% recorded higher N1 values with significant differences (P < 0.05). Nitrogen retention (g/h/a) was positive in all tested groups indicating that the animals were in normal N metabolism status. Nitrogen balance was found to be improved due to

the inclusion of DDGS in the diet of sheep. This may be due to the increase in N digestibility. Similar results were recorded by Peter *et al.* (2000).

Table (4). Dietary nitrogen utilization of the experimental rations by sheep.

Item	R1	R2	R3	R4
Nitrogen intake (g/h/d)	23.62 [b]	24.00 [b]	25.15 [a]	24.69 [a]
Fecal nitrogen (g/h/d)	9.38 [a]	7.60 [b]	7.43 [b]	7.60 [b]
Digested nitrogen (g/h/d)	14.24 [b]	14.40 [b]	17.62 [a]	17.09 [a]
Urinary N (g/h/d)	10.05 [b]	11.25 [a]	11.91 [a]	11.33 [a]
Nitrogen retention (g/h/d)	3.73 [c]	4.15 [b]	5.71 [a]	5.76 [a]
N intake %	15.80	17.29	22.70	23.33
N digested %	26.19	28.82	32.41	33.70

a, b, c means in the same row with different superscripts significantly different (P< 0.05).

Rumen parameters:

Results of ruminal pH, volatile fatty acids (VFA'S) and ammonia nitrogen (NH_3-N) are presented in Table (5). Rumen pH value is one of the most important factors which affect bacterial fermentation in the rumen and influences its functions. Results showed that no significant differences (P< 0.05) among experimental diets on ruminal pH. The obtained values were within the normal ranges (6.70- 6.84) as reported by Hungate (1966), who indicated that cellulytic bacteria need a rumen pH of about 6.2 and 7.0 in order to multiply rapidly and colonize the epidermal surfaces of plant fragments, within 5 minute. Means of individual animals exhibited a much narrower range (6.70 – 6.84). The small decrease in ruminal pH in the current study may be a result of the residual starch in DDG'S that degraded rapidly in the rumen, and decrease ruminal pH (Leupp *et al.*, 2009). Regarding the effect of sampling time, the results indicated that the highest value was recorded at zero time and tended to decrease at 3hrs, then returned to increase at 6 hrs post feeding. The data may be related to the fermentation processes of both non-structural and structural carbohydrates and producing of volatile fatty acids.

Table (5). Effect of feeding the experimental rations on some rumen parameters of Rahmany sheep at different times of sampling.

		Experimental rations			
Item		TMR1	TMR2	TMR3	TMR4
Time of sampling					
pH	0	7.18	7.09	7.05	7.03
	3	6.20	6.14	6.08	6.03
	6	7.15	7.07	7.09	7.03
	Mean	6.84	6.77	6.74	6.70
NH_3-N (mg/100 ml)	0	12.90	12.11	12.03	11.35
	3	16.60	15.0	14.30	13.61
	6	12.81	12.20	12.03	11.55
	Mean	14.10[a]	13.11[b]	12.79[b]	12.17[c]
TVFA'S (mmol/100 ml)	0	5.75	6.91	7.41	7.55
	3	8.11	9.31	10.21	10.71
	6	6.02	6.85	7.41	8.12
	Mean	6.63[C]	7.69[b]	8.34[a]	8.79[a]

a, b, c means in the same row with different superscripts are significantly differ (P< 0.05).

The volatile fatty acids were increased with proceeding time and cause a reduction in ruminal pH, until they were proportionally more absorbed from the rumen wall, resulting the present increase in pH. The present results agree with the findings of Reddy and Reddy (1985); El-Shinnawy (2003, 2010) and El- Shinnawy *et al.* (2011).

Ammonia-N concentration was greater for control diet which is due to the higher degradable protein concentration of this diet. There was a linear decrease in ammonia-N concentration as the level of DDG'S increased in diets containing 10, 20 and 30% DDG'S. This result may be due to the replacement of yellow corn and soybean meal with DDG'S which resulted in lower of degradable crude protein in the

rumen. This result is in agreement with that obtained by Anderson *et al.* (2006) who found a significant decrease in ammonia- N concentration with DDG'S feeding. In this respect, Firkins *et al.* (1984) reported that soybean meal protein was more degradable than corn distiller grains protein in the rumen. Mc Carthy *et al.* (1989) reported that 5 to 6 mg/dl of ammonia is adequate to stimulate microbial protein synthesis. In the present study, ruminal ammonia concentration of diets containing DDG'S were 13.11, 12.95 and 12.77 of TMR 2, 3 and 4, respectively. These amounts of ammonia are adequate enough to allow maximum microbial protein synthesis.

The results showed that the overall mean of TVFA'S concentration was lower significantly ($P< 0.05$) for rams fed control ration, while there was no significant difference between TMR3 and TMR4 fed rations containing DDG'S. Supplemented with DDG'S showed significant increase in total TVFA'S concentrations than control. These results are in agreement with those obtained by Soliman *et al.* (2013) who found linear increase of total VFA'S with increasing DDGS supplementation amount.

Blood parameters:

Blood represents an important index of physiological, pathological and nutritional status of the organism. Changes in the constituent compounds of blood, when compared to the normal values, could be used to interpret the metabolic status of the animal and perhaps nutrient adequacy of feed consumed (Nworgu *et al.*, 2007).

Data presented in Table (6) showed that increasing level of DDGS in diets of calves increased TP concentrations, being the lowest in TMR1 (control). The normal range of TP was reported by kancko (1989) to be 6.0- 7.9 mg/ dl while, Jawasreh *et al*, (2010), showed that it was 5.9- 7.8 mg/dl. Albumin and globulin concentrations for animals fed the experimental rations, containing DDGS recorded insignificant difference.

Higher concentration of serum total protein may be attributed to improve nitrogen absorption (Kornegay *et al.*, 1997). The values of AST were higher significantly ($P < 0.05$), with rations containing DDGS than that of the control (Table 6).

Baranowski *et al.* (2000) found that there is a positively correlation between body weight and AST. Serum ceratinine and cholesterol mean values were not affected by fed treatment rations. The values obtained here in were within the normal range for healthy sheep for cholesterol (Saleh & Saleh 2003) and creatinine (Jawasreh *et al.,* 2010). Results obtained were similar with those reported by Etman *et al.* (2010).

Generally, the obtained results concerning blood parameters studied indicated normal physiological and healthy status of all experimental calves.

Table (6). Effect of feeding the experimental rations on some blood serum parameters of buffalo's calves as affected by experimental rations.

Measurements	TMR1 control	TMR2	TMR3	TMR4
Total protein (g/dl)	6.45^{c}	6.75^{b}	6.79^{b}	7.28^{a}
Albumin (g/dl)	3.55	3.61	3.63	3.68
Globulin (g/dl)	2.90	3.14	3.16	3.60
A/G ratio %	1.82	1.87	1.87	1.98
AST (U/L)	24.15^{c}	27.33^{b}	28.11^{b}	30.10^{a}
ALT (U/L)	15.77	16.11	16.22	15.91
AST/ ALT ratio (%)	1.53	1.70	1.74	1.89
Ceratinine (mg/dl)	1.29	1.18	1.15	1.25
Cholesterol (mg/dl)	128.13	126.71	127.33	127.81

a, b, c in the same row with different superscripts significantly differ (P< 0.05).

Growth performance:

Results obtained in Table (7) indicated that group fed on control ration recorded significantly ($P< 0.05$) lower body weight gain than groups fed on rations containing 10%, 20%, and 30% DDGS. Total body gain and daily gain were increased ($P< 0.05$) with increasing replacement of DDG'S. Average daily gain was increased by 16%, 21% and 23% for calves fed rations containing 10%, 20% and 30% DDG'S, respectively, than that of control.

These results are in agreement with those obtained by Berger and Ferkins (1985). They observed that steers fed DDGS grow more rapidly and were more efficient than those fed corn-gluten diet. Felix *et al.* (2012) reported that lambs fed the 20% DDGS diet had the greatest gain. On the contrary, Leupp *et al.*

(2009) found that ADG was not affected when fed steers on 30% distillers dried grains with soluble. Similar results were reported by Wood *et al.* (2011), who reported that supplement of 200 gm DDG'S/Kg diet to crossbred steer did not affect daily gain on average.

Table (7). Growth performance of buffaloes as affected by feeding TMR containing different levels of DDGS.

Items	Experimental rations			
	TMR1	TMR2	TMR3	TMR4
Initial live body weight, kg	204.5	202.3	201.2	201.1
Final live body weight, kg	368.9^{c}	392.6^{b}	3998^{a}	402.6^{a}
Total body weight gain, kg	164.4^{c}	190.3^{b}	198.6^{a}	201.5^{a}
Daily gain, kg	0.913^{c}	1.057^{b}	1.103^{a}	1.119^{a}
Feed intake, kg/h/day	9.350	9.500	9.610	9.650
Total DM1, Kg/h/day	8.369^{d}	8.486^{c}	8.567^{b}	8.628^{a}
Total digestible nutrients kg/h/day	5.787	5.975	6.109	6.187
Total DCP, Kg/h/day	0.781	0.818	0.858	0.851
Feed conversion				
DM1/daily gain	9.166^{a}	8.028^{b}	7.770^{c}	7.710^{c}
TDN intake/ daily gain	6.338^{a}	5.633^{b}	5.538^{c}	5.529^{c}
DCP intake/ daily gain	0.855^{a}	0.774^{b}	0.778^{b}	0.715^{c}

a, b, c means in the same row, with different superscripts are significantly differ (P< 0.05).

Data in the present study show that DDG'S replacement has non-significant increase in total dry matter intake. Similar results were reported by Huls *et al.* (2006) who reported that no positive or negative effect for DDG'S replacement by 23% on DMI. In contrast Soliman and Ghada El Ashry (2012) indicated that incorporate DDG'S at levels of 10, 20 or 30% in sheep rations increased DM intake.

Feed conversion expressed as Kg DM/Kg gain showed that the calves fed diets containing 30% DDG'S, recorded the best values (7.710) followed by 20% DDG'S (7.770), while the worst value was recorded with the control ration. The same trend was observed with TDN and DCP. These results are in agreement with those obtained by soliman and Ghada El Ashry (2012) who reported positive effect for DDG'S replacement by 10, 20, or 30% on feed conversion with sheep.

Economic efficiency:

The profitability of using DDGS in growing and finishing diets of buffalo calves depends on the cost of these ingredients and their effect on growth performance.

Data presented in Table 8, show that lowest cost/ kg body weight gain (17.63 LE), was observed with calves fed 30% DDGS followed by those fed 20% level (18.20 LE), while the highest (22.53 LE), was recorded with control group (zero DDGS).

Table (8). Economic evaluation of buffalo calves as affected by feeding TMR containing different levels of DDGS.

Items	Experimental rations			
	TMR1	TMR2	TMR3	TMR4
Feed intake, kg/h/day	9.350	9.500	9.610	9.650
Feed cost, LE/h/day	20.570	20.380	20.080	19.730
Initial live body wt, kg	204.500	202.300	201.200	201.100
Final live body wt, kg	368.900	392.600	399.800	402.600
Total body wt. gain, kg	164.400	190.300	198.600	201.500
Daily gain, kg	0.913	1.057	1.103	1.119
Feed cost, LE/kg gain	22.530	19.280	18.200	17.630
Net revenue, LE	5.470	8.720	9.800	10.370
Economic efficiency	0.270	0.430	0.490	0.520
Relative economic efficiency	0.100	0.159	0.179	0.190

Free market prices (LE/ ton) for feed ingredients used in formulating the TMR in the year (2015).
Yellow corn 1800, soybean meal 3700, wheat bran, 1800; DDGS, 2200; Berseem hay, 1600; Molasses, 700; Salt, 2oo; Lime stone, 100; Premix, 3000 and add 100 LE for mixing.
Price / kg live wt. (LE) = 28.

This may be due to include DDGS in the diets scored better, body weight, weight gain, besides best feed conversion.

Average economic efficiency values of different dietary treatments ranged between 0.27 and 0.52, being the best for calves fed the higher level of DDGS (30%) compared to the worst values by calves fed the control ration. Relative economic efficiency increased as the level of DDGS increased in calves diets, compared to the control.

Therefore, replacing 10, 20 and 30% of soybean and yellow corn by DDGS can be used in buffalo calves diets to get better feed cost per kg daily gain, net revenue and economic efficiency. Generally, it may be shown that, inclusion of DDGS with a rate of 30% in buffalo calves diets tended to economical effectiveness.

CONCLUSION

Conclusively, according to the circumstances of this study, it could be recommended that replacement up to 30% of soybean meal and yellow corn by dried distiller grains with soluble (DDGS) in growing and finishing buffalo calves diet is a good source realized improvement in all digestion coefficients, nutritive values and rumen fermentation activity, also increased total body weight gain and average daily gain as well as improved the economic efficiency without adverse effect on health of buffalo calves.

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تأثير إحلال مستويات مختلفة من النواتج الثانوية لتقطير الحبوب محل كسب فول الصويا وجزء من الأذرة في عليقة نمو وتسمين العجول الجاموسي

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أجريت هذه الدراسة بمحطة قطعان التغذية بطوخ قليوبية وكلية زراعة المنصورة والمركز الاقليمي للأغذية والأعلاف بالتعاون مع معهد بحوث الإنتاج الحيواني –وكان الهدف فيها دراسة تأثير إحلال مستويات متدرجة من نواتج تقطير الأذرة DDGS لتحل محل كسب فول الصويا وجزء من الأذرة الصفراء .وقد إستخدم في الدراسة ثمانون عجل جاموسي نامي عمر 14-16 شهراً وبمتوسط وزن 202 كجم، تم تقسيمهم عشوائياً إلى أربعة معاملات غذائية متساوية (20) عجل لكل معاملة (وتم تكوين العلائق باحلال صفر، 10، 20، 30 % من نواتج تقطير الأذرة بالسوائل محل كسب فول الصويا والأذرة الصفراء Total mixed ration (TMR) في معاملات 1، 2، 3، 4 على التوالي وكان يتم تقديم العلائق بمعدل 3 % من وزن الحيوان واستمرت التجربة لمدة 180 يوماً.
وكانت النتائج المتحصل عليها كالآتي :

- إنخفاض معنوى عند مستوى (5%) في وزن الجسم ومعدل النمو اليومي في العجول المغذاه على عليقة المقارنة بينما سجلت المجموعتان التى تم تغذيتهما على 20، 30 % نواتج تقطير الأذرة أحسن القيم معنوياً.
- أظهرت النتائج إنخفاضاً معنوياً عند مستوى (5%) بمجموعة المقارنة في معاملات الهضم والقيم الغذائية والنيتروجين المحتجز عن باقي المعاملات.
- لم يكن هناك إختلافات معنوية عند مستوى (5%) في درجة حموضة الكرش وكانت القيم المتحصل عليها في المدى الطبيعى. (6.70-6.84)
- كان تركيز الأمونيا في سائل الكرش مرتفعاً مع عليقة المقارنة وقد يرجع ذلك لوجود نسبة عالية من البروتين المتكسر في العليقة –كما لوحظ إنخفاض تدريجي في تركيز الأمونيا بزيادة نسبة إحلال نواتج التقطير في العليقة.
- تدعيم العلائق بـ DDGS أدى إلى زيادة معنوية في تركيز الأحماض الدهنية الطيارة والجلوبيولين والكرياتينين والكوليسترول بين المجموعات المختلفة –وأوضحت مقاييس الدم التى تم دراستها أن الحالة الفسيولوجية للعجول طبيعية وأنها في صحة جيدة.
- زيادة مطرده في وزن الجسم ومعدل النمو اليومي بزيادة نسبة إحلال نواتج التقطير في العليقة –وان العجول المغذاه على عليقة تحتوى على 20 أو 30% نواتج تقطير حققت أحسن معدل تحويل غذائي.

وخلصت النتائج إلى أن تضمين العلائق بنواتج تقطير الحبوب بنسبة 30% بدلاً من كسب فول الصويا والأذرة الصفراء في علائق العجول الجاموسي قد حققت احسن عائد إقتصادى وكفاءة إقتصادية وأقل تكلفة تغذية لإنتاج كجم نمو.