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Role of Damsisa and Synbiotics in Treatment of Unthriftiness in Buffalo Calves in Sharkia Governorate

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Abstract

Unthriftiness is the major problems affect health and body performance of calves and induce many losses even with treatment. So, the aim of the present study was to investigate some adverse effects of unthriftiness on hematobiochemical parameters and some antioxidant enzymes as well as using Ambrosia maritime or synbiotics each alone with mineral mixture in treatment unthrifty calves. A total of 20 buffalo calves of 4-6 month old (5 healthy calves and their body weight 200-250 kg, in addition to 15 unthrifty calves and their body weight 120-150 kg) belonged to a private farm in Abo Hamad City - Sharkia Province. All calves were injected with one dose of Ivomec super to ensure that all calves were free from internal and external parasite. At day 30 post Ivomec injection, calves were divided into 4 equal groups (5/each). All calves were received 3 kg concentrates contain 2 kg mineral mixture/ton and 5 kg berseem all over the experimental period. The 1st group healthy buffalo calves (-ve control), the 2nd group unthrifty calves not treated (+ve control), the 3rd group unthrifty calves received 0.5 ml synbiotics /I liter drinking water for 60 successive days, the 4th group unthrifty calves received 1 % dried leaves of damsisa for 60 days. All caves were weighted at start of the experiment and at the 1st day post treatment for determination weight gain and FCR. At the 1st day post treatment blood samples were taken from all calves for estimation some hematobiochemical parameters. Unthrifty calves show significant decrease in serum copper, iron, selenium, zinc, body weight gain, RBCs, Hb, PCV, WBCs, serum total protein albumin, globulin, A/G ratio cholesterol, CAT and SOD beside insignificant decrease in Ca, Ph, Na, FCR, total lipid, triglycerides and MDA associated with non-significant increase in AST, ALT, ALP. Findings revealed that unthrifty calves received synbiotics or damsisa for 60 successive days displayed significant increases in weight gain, total protein, albumin, globulin, A/G ratio, beside insignificant increases in copper, iron, selenium, zinc, Ca, Ph, Na, RBCs, Hb, PCV, WBCs, AST, ALT, ALP, Total lipid, triglyceride, MDA coupled with non-significant decreases in RBCs, Hb, PCV and WBCs, serum cholesterol, CAT and SOD. It could be concluded that unthriftiness induce many adverse effects in health and body performance of calves but mineral mixture with synbiotics or with damsisa had better results in improvement the adverse effects in hematobiochemical parameter in unthrifty calves.

KEYWORDS
Unthrifty calves, Mineral mixture, Synbiotics, Damsisa, Trace element, Macro elements

INTRODUCTION

Unthriftiness occurs when calves grow slower than expected on a known amount of food (Radostits *et al*., 2007). Unthriftiness occurs when animal failure to make normal weight (Mahmoud, *et al*., 2015). It has presented many causes for reduction in body weight as intestinal parasite, trace elements deficiency environmental stress and management variables (climatic condition, type of soil and weaning practices) (Salah *et al*., 2022).

Synbiotics are a mixture of a probiotic and prebiotic (De Vrese and Schrezenmeir, 2008). They improved intestinal microbiota (Scavuzzi, 2014), survival of important microorganisms in ration (Radzikowski, 2017) and stimulate proliferation of beneficial bacterial strains in gastrointestinal tract (Gourbeyre *et al*., 2011). Probiotics are active in small and large intestine beside prebiotic is active in large intestine (Hamasalim, 2016). Probiotics in animals ration improves immune function, body weight, and feed conversion ratio (Reid and Friendship, 2002).

Plant products are rich in phytogenic substances such as phenolic compounds, flavonoids, terpenoids which play an important role in improved body weight gain beside reduce in feed conversion rate (Jung *et al*., 2009). Ambrosia maritima is important herbal plant used in folkloric medicine, which grow in Mediterranean region and Africa (Reda *et al*., 2000). Ambrosia maritima contains two main active phytogenic compounds as ambrosin and damsin (Alard *et al*., 1991). In Egypt ambrosia maritima is known as Damsisa (Rice-evans *et al*., 1995). Damsisa plays an important role in treatment many diseases such as asthma, renal colic, frequent urination and expel renal stones and acts as anti-spasmodic molluscicidal, diuretic (Saker *et al*., 2000).

The present study aimed to investigate the effect of unthriftiness in hematobiochemical parameters beside role of synbiotics and Ambrosia maritime in overcome adverse effect of unthriftiness.

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MATERIALS AND METHODS

Experimental animal

A total of 20 buffalo calves of 4-6 month old (5 healthy calves and their body weight 200-250 kg +15 unthrifty calves and their body weight 120-150 Kg) belonged to private farm in Abo Hamad City-Sharkia Province. All calves were injected with one dose of Ivomec super injectable solution contain 1 g ivermectin and 10g clorsulon produced by Eva Company Egypt for veterinary use, was injected as 1ml/50kg body weight s/c (Radostitis *et al*., 2007), to get ride from possible internal and external parasites infection. All calves were received 3 kg concentrate contain 2 kg mineral mixture/ton and 5 Kg berseem all over the experimental period (Table 1).

Table 1. Composition of the basal diet used during experiment.

Ingredient	Composition (Kg)
yellow corn	550
wheat bran	150
Soya bean meal	75
Cotton seed cake	125
balady bean meal	75
Mineral mixture	2
Bone meal	5
Limestone	5
Vitamins/ minerals premix	5

Experimental design

Calves were divided into 4 equal groups (5/each). The 1st group healthy buffalo calves (-ve control), the 2nd group unthrifty calves not treated (+ve control), the 3rd group unthrifty calves received 0.5 ml synbiotics /liter drinking water for 60 successive days, the 4th group unthrifty calves received 1% dried leaves of damsisa for 60 days. All calves were weighted at start of the experiment and the 1st day post treatment for determination weight gain and feed conversion rate. On the 1st day post treatment two blood samples were taken from each calf.

The 1st sample was collected in tube contain ethylenediamine tetra acetic acid (EDTA) for estimation erythrogram and WBCs (Feldman *et al*., 2000).

The 2nd sample was collected to obtain clear serum for estimation of total protein (Doumas *et al*., 1981), and albumin levels (Drupt, 1974), serum globulin level was calculated as difference between total protein and albumin, transaminases; aspartate aminotransferase (AST) and alanine aminotransferase (ALT) activities (Reitman and Frankel, 1957), alkaline phosphatase (ALP) (John, 1982), total lipid (Knight *et al*., (1972), triglycerides (Royer, 1969), cholesterol (Richmon, 1973), malondialdehyde (MDA) (Ohkawa *et al*., 1979), superoxide dismutase (SOD) (Nishikimi *et al*., 1972) catalase (CAT) (Aebi, 1984), calcium (Glindler and King, 1972), inorganic phosphorus (Goldenbery 1966), sodium (Oser, 1979), copper (Zak, 1958), iron (Dreux, 1977), zinc (Versieck *et al*., 1974), and selenium (Fernadez and Kahr, 1971) levels.

Statistical analysis

The obtained data was analyzed by using computerized SPSS program version 16 according to Tambane and Dunlop (2000).

RESULTS

Micro and macro elements

The results present in Table 2, revealed that unthrifty buffalo calves showed significant decreases in serum copper, iron, zinc and selenium levels coupled with non-significant decreases in serum calcium, inorganic phosphorus and sodium levels. Micro and macro elements profile were improved by using synbiotics and damsisa.

Table 2. Macro and microelement of healthy and unthrifty calves (n=5).

	Gp (1)	Gp (2)	Gp (3)	Gp (4)
Macro elements				
Ca (mg/dl)	9.08±0.65a	8.89±0.72a	9.41±0.83a	9.48±0.97a
Ph (mg/dl)	6.63±0.28a	6.56±0.83a	6.90±0.79a	6.89±0.98a
Na (mmol/l)	2.71±0.17a	2.64±0.36a	2.96±0.75a	2.99±0.89a
Trace element				
Copper (µg/dl)	26.57±0.65a	21.42±0.83b	27.08±0.96a	26.29±0.88a
Zinc (µg/dl)	13.55±0.93a	9.0±0.67b	13.89±0.94a	13.79±0.93a
Iron (µg/dl)	147.45±0.81a	42.23±0.55b	149.79±0.98a	148.98±0.96a
Selenium (µg/dl)	19.32 ± 0.76a	14.06±0.95b	19.87±0.95a	19.68±0.98a

Mean values with different letter (a, b) of the same row indicate significant difference at $P < 0.05$

Table 3. Body performance of healthy and unthrifty calves

	Gp (1)	Gp (2)	Gp (3)	Gp (4)
Initial body weight	240.23±1.59a	176.86± 1.64b	175.56± 1.95b	176.96± 1.79b
Final body weight	280.93±1.84a	206.83± 1.98d	240.54± 1.79b	235.89± 1.76c
Weight gain	40.70±0.89b	29.97± 0.98d	64.98± 1.65a	58.93± 1.87a
FC	180	180	180	180
FCR	4.42±0.19b	6.01±0.32a	2.77±0.27b	3.05.32b

FC: Feed consumption; FCR: Feed consumption rate.
Live body weight, weight gain (Kg), food consumption (Kg) and feed conversion rate (%).
Mean values with different letter (a, b) of the same row indicate significant difference at $P < 0.05$

Body weight

Unthrifty calves showed a significant decrease in weight gain and increase in FCR. Treatment of unthrifty calves using synbiotics or damsisa in ration for 60 successive days in tested dose displayed significant increase in weight gain and improved FCR (Table 3).

Hematology

There were significant decreases in RBCs, Hb, PCV and WBCs in unthrifty calves meanwhile treatment unthrifty calves by synbiotics and damsisa showed non-significant decreases in RBCs, Hb, and PCV (Table 4).

Liver function

Unthrifty buffalo calves had nonsignificant increases in serum AST, ALT activities that associated with significant decreases in total protein, albumin, globulin, and A/G ratio. Treatment of unthrifty calves using synbiotics and damsisa resulted in improvement in the levels of the above variables (Table 5).

Lipid profile and antioxidant enzymes

Unthrifty buffalo calves showed significant increases in total lipid, triglycerides and MDA levels, beside significant decreases in serum cholesterol level, and in serum SOD and CAT activities. Treatment unthrifty calves using synbiotics and damsisa restored the normal levels for the studied lipid profile and antioxidant enzymes (Table 6).

DISCUSSION

The present study revealed that unthrifty calves showed significant reduction in serum copper, iron, selenium, and zinc, beside non-significant decreases in Ca, Ph, Na. Unthrifty calves show significant decrease in serum trace elements (Ahmed and Ghada, 2007). Same changes in trace elements in unthrifty calves were recorded by Aref *et al.* (2009) who stated that Friesian calves suffering from unthriftiness revealed significant decrease in copper and zinc levels. Same changes were also recorded by Mahmoud *et al.* (2015) who stated that unthrifty calves had a significant reduction in the serum copper, iron, selenium, and zinc, beside increases in serum calcium, phosphorus and sodium levels. In addition, Salah *et al.* (2022) found a significant decrease in trace elements in unthrifty cattle.

Finding from this study revealed that unthrifty calves received mineral mixture with synbiotics or mineral mixture with damsisa in ration for 60 successive days in tested dose displayed improved micro and macro-elements compared with control calves. Same observations were recorded previously by Abdou *et al.* (2010) reported that unthrifty rams received mineral mixture showed increase in microelement and macro-elements. These results were similar with Deepika *et al.* (2021) who found that goats received mineral mixture showed improved in serum elements.

The present study revealed significant decreases in body weight gain and increase in FCR in unthrifty calves. Reduction in body weight in diseased calves may be due to reduction in nutrient in ration especially trace element (Radostits *et al.*, 2000). In same line, Radwan *et al.* (2008) mentioned that zinc deficiency induces reduction in body gain and increase FCR. Similar reduction in body weight gain and increase in FCR were reported previously by Abdou, *et al.* (2010) in lambs suffering from unthriftiness. The same reduction in body weight gain and increase in FCR was recorded by Mahmoud *et al.* (2015) in buffalo calves suffered from

Table 4. Some hematological parameters in healthy and unthrifty calves

	Gp (1)	Gp (2)	Gp (3)	Gp (4)
RBC ($x10^6$/µl)	7.43±1.26a	5.03±1.13b	7.07±1.21a	7.12±1.09a
Hb (g/dl)	11.54±1.34a	8.24±1.22b	11.76±1.47a	11.90±1.15a
PCV (%)	23.05±1.22a	18.12±1.03b	22.94±1.23a	23.08±1.55a
WBC ($x10^3$/µl)	8.32±1.32a	5.58±1.72b	7.98±1.08a	8.09±1.87a

Mean values with different letter (a, b) of the same row indicate significant difference at $P < 0.05$

Table 5. Liver function of healthy and unthrifty calves.

	Gp (1)	Gp (2)	Gp (3)	Gp (4)
AST (U/L)	65.52±1.25a	67.81±1.26a	66.09±1.85a	65.90±1.67a
ALT (U/L)	44.53±1.08a	46.44±1.21a	45.31±1.54a	45.08±1.22a
ALP (U/L)	72.52±1.34a	75.32±1.18a	72.07±1.34a	71.97±1.68a
T. protein (g/dl)	6.87±1.64b	4.71±1.32c	8.58±1.28a	8.68±1.31a
Albumin (g/dl)	3.74±0.58b	1.95±0.36c	4.46±0.58a	4.49±0.86a
Globulin (g/dl)	3.13±0.73b	2.76±0.16c	4.12±0.76a	4.19±0.97a
A/G ratio	1.03±0.25a	0.72±0.23b	1.08±0.35a	1.07±0.44a

Mean values with different letter (a, b) of the same row indicate significant difference at $P < 0.05$

Table 6. Lipid profile, MDA, SOD and CAT of healthy and unthrifty calves

	Gp (1)	Gp (2)	Gp (3)	Gp (4)
Total lipid (mg/dl)	246.12±1.92b	260.3±1.89a	247.12±1.69b	247.32±1.37b
Cholesterol (mg/dl)	68.26±1.67 a	60.13±1.32b	66.19±1.78a	67.64±1.66a
Triglycerides (mg/dl)	52.36±1.21 b	79.12±1.53a	53.34±1.78a	52.87±1.77a
MDA (mmol/ml)	3.57±0.46 b	7.37±0.76a	4.08±0.48b	4.13±0.51b
CAT (U/ml)	2.99±0.21a	1.05±0.16 b	2.76±0.45a	2.89±0.64 a
SOD (U/ml)	405.05±6.32 a	381.21±3.71b	398.56±4.84a	404.12±4.93a

Mean values with different letter (a, b) of the same row indicate significant difference at $P < 0.05$

unthriftiness.

The obtained finding revealed that, unthrifty calves treated with mineral mixture with synbiotics or mineral mixture with damsisa in ration for 60 successive days in tested dose displayed improvement in weight gain and FCR compared with control calves. In addition, Dhruvaraj *et al*. (2013) recorded that minerals mixture induced increase in body performance of cattle. Same results were reported by Tiwari *et al*. (2000) who stated that mineral mixture induced improvement in body weight gain. Similar results were observed by Hamasalim (2016) who stated that synbiotics s as feed additives improved body performance. Similar changes in body performance were observed by Ahmed and Khater (2001) who reported that Ambrosia maritime improved body weight, weight gain and feed conversion rate. Ambrosia maritime in rats resulted in elevated body weight (Halaby *et al*., 2018). Elevation in body weight gain may be due to high protein content in Ambrosia maritima (ELmuaiz *et al*., 2020).

The Present investigation declared significant decreases in RBCs, Hb and PCV, WBCs thatin unthrifty calves. Reduction in erythrocytes count in unthrifty animals may be attributed primarily to iron deficiency that led to depression of erythropoiesis (Radostits *et al.,* 2000). Similar changes in blood picture were reported by Amal (2001) who mentioned that calves suffering from trace elements deficiency revealed reduction in RBCs, Hb, PCV and WBCs. The obtained results agreed with those reported by Mohamed *et al*. (2014) who found significant decrease in erythrogram and WBCs in unthrifty calves. Ill-thrift calves showed normocytic normochromic anemia (Mahmoud *et al*., 2015).

Finding from this study revealed that, unthrifty calves treated with mineral mixture with synbiotics or mineral mixture with damsisa in ration for 60 successive days in tested dose improved RBCs, Hb and PCV, and WBCs compared with control calves. Improvement in erythrogram may be due to presence of copper and iron in mineral mixture which enhance bone marrow to produce enough erythrocyte (Nasser *et al*., 2000). Same results were reported by Deepika *et al*. (2021) in goats that received mineral mixture. Elevation in RBCs, Hb and PCV post mineral mixture supplementation may be due to the presence of copper and zinc which play an important role in haemoglobin synthesis (Yadav *et al*., 2017). In addition, Dar *et al*. (2017) reported increase in RBCs, Hb and PCV in crossbred calves received synbiotics . Same changes in total leukocytic count were reported by El-Mehanna *et al*. (2017) in lambs received synbiotics. Also, the results agreed with Abuelgasim *et al*. (2007). Ambrosia maritima induced an increase in RBCs, Hb and PCV due to the presence of many phytogenic substances. These results agree with ELmuaiz *et al*. (2020) who reported that ambrosia maritima caused non-significant increase in RBCs, Hb and PCV, but there was a significant reduction in WBCs count.

The obtained results showed non-significant increases in AST, ALT and ALP activities in unthrifty calves. These changes in liver enzymes may be due to degenerative change and necrosis of liver and muscles of unthrifty animal (Radostits *et al*., 2000). Liver enzymes were elevated in unthrifty rams (Abdou, *et al*. (2010), and in unthrifty calves (Mahmoud *et al*., 2015).

It has been noticed that unthrifty calves received mineral mixture with synbiotics or mineral mixture with damsisa for 60 successive days in the tested dose displayed non-significant increase in serum liver enzyme. Similar results were reported by Abbas (2002) stated that unthrifty calves received mineral mixture induce non-significant increase in liver enzymes. Lambs received synbiotics showed nonsignificant increase in AST, ALT and ALP activities (Abdel-Salam *et al*., 2014). Similar results were reported by Markowiak and Śliżewska (2018) who mentioned that synbiotics induced increase in liver enzymes. Ambrosia maritima induced reduction in AST due to hepatoprotective of ambrosia maritima leading to improvement of the hepatocytes (Ahmed and Khater, 2001), In addition, Rajesh and Latha (2004) reported that phytogenic compound in ambrosia as phenol compounds play a role in hepatic lipid antioxidation leading to improve liver enzymes. Oral administration of aqueous extract of ambrosia maritima leaves to rats revealed insignificant reduction AST, ALT and ALP activities (ELmuaiz *et al*., 2020)

The result obtained in this study revealed that unthrifty calves showed significant decrease in serum total protein albumin, globulin and A/G ratio. The above mentioned results were supported by El-Sayed *et al*. (1999) stated that zinc deficiency induced a significant decrease in total protein in buffalo calves. Our finding is similar to the result of other researchers Aref *et al*. (2009) reported that unthrifty Friesian calves showed significant decrease in total protein albumin and globulin. Ill-thrift calves showed reduction in serum total protein albumin and globulin due to reduction in zinc which play an important role in protein biosynthesis (Mahmoud *et al*., 2015). Unthrifty calves show decrease in protein profile (Salah *et al*., 2022)

The obtained result in this study revealed that, unthrifty calves received mineral mixture with synbiotics or mineral mixture with damsisa for 60 successive days in the tested dose displayed significant increases in total protein, albumin, globulin and A/G ratio. Unthrifty calves that received selenium showed increases in total protein, albumin and globulin level (Radostits *et al*., 2000). Unthrifty calves received selenium improved serum total protein because selenium was reported to increase the absorption of globulin and essential protein digested products leading to increase in total protein (Abbas, 2002).

These results agreed with Kazemi *et al*. (2013) and Moarrab *et al*. (2016), they mentioned that lambs received synbiotics improved protein level. Same findings were reported by Didarkhah and Vatandoost (2021) who stated that lambs received synbiotics had significant increases in total protein, albumin and globulin. In addition, Ilgaza and Zolovs (2021) mentioned that calves received synbiotics resulted in improvement in protein profile. Elevation in total protein and albumin and globulin levels may be due to high crude protein in Ambrosia maritima another explanation for improvement in protein profile Eman *et al*. (2014) may be due to hepatoprotective effect of ambrosia maritime (Abuelgasim *et al*., 2007) Ambrosia maritime extract induced increase in total protein, albumin and globulin in rats (Helal, *et al*., 2015). Ambrosia maritima increased protein profile due to its high protein content (ELmuaiz *et al*., 2020).

This study revealed that, unthrifty buffalo calves had significant increases in total lipid, and triglycerides levels beside decrease in cholesterol level. Elevation in total lipid, and triglycerides beside decrease in chlosterol may be due to decrease in food intake due to zinc and copper deficiency and lipolysis of adipose tissue that help to release long chain fatty acids which were changed by the liver to ketones (Eissa, 1998). Same changes in lipid profile were reported previously by Abdou *et al*. (2010).

The obtained results revealed that, unthrifty calves received mineral mixture with synbiotics or mineral mixture with damsisa for 60 successive days in tested dose displayed significant reduction in serum total lipid, cholesterol levels and serum triglycerides The results are reinforced by Zatollah *et al*. (2014) who stated that Synbiotics in ration induced in a significant reduction in serum total lipid, cholesterol and triglycerides. Results from this study are supported by the result of ELmuaiz *et al*. (2020) who found that rats received ambrosia leaves extract for 21 days caused significant reduction in plasma cholesterol and insignificant changes in triglycerides compared to control group.

In the present study, unthrifty buffalo calves displayed significant increase in MDA and decrease in CAT and SOD. Unthrifty buffalo calves showed significant decrease in antioxidant enzyme and increase in MDA (Mahmoud *et al*., 2015). Same results were recorded Ahmed and Ghada (2007) found that unthrifty calves have high MDA and low CAT and SOD. Antioxidants enzymes decreased in unthrift Friesian calves (Aref *et al*., 2009). Same results were obtained by Abou El-Amaiem (2012) stating that unthrifty buffalo calves showed significant increase in lipid peroxidation leading to increase in MDA and decrease in CAT and SOD. Unthrifty calves show decrease in SOD and CAT (Mahmoud *et al*., 2015). Same changes were recorded (Salah *et al*., 2022) found that unthrift calves showed decrease in CAT and SOD activities.

The obtained result in this study revealed that unthrifty calves received mineral mixture with synbiotics or mineral mixture with damsisa for 60 successive days in the tested dose displayed significant elevation in CAT and SOD activities beside reduction in MDA level. The results are reinforced with those recorded by Zatollah *et al*. (2014) who found that synbiotics led to a significant increase in plasma total CAT and SOD activities. Close similarity was seen between this finding and obtained by Khalil *et al*. (1981) who reported that Ambrosia maritima induced increase in super oxide dismutase coupled with decrease oxidative stress and malondialdehyde. Our results go hand in hand with those reported Ahmed and Khater (2001) indicated that flavonoids in ambrosia maritime act as antioxidant agent inducing increase in CAT, SOD, and decrease in MDA. Results from the current study were supported by the results obtained by ELmuaiz *et al*. (2020) who mentioned that rats receiving aqueous extract of ambrosia induce significant elevation in CAT and SOD activities beside a decrease in MDA level.

CONCLUSION

Unthriftiness induce many adverse effects in health and body performance of calves but mineral mixture with synbiotics or with damsisa had better results in improving the adverse effects in hematobiochemical parameter in unthrifty calves.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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