

COMPARATIVE STUDY ON PARTIAL AND COMPLETE REPLACEMENT OF FIELD GROWN MAIZE WITH HYDROPONIC MAIZE AND THEIR EFFECT ON HAEMATOLOGICAL PARAMETERS IN OSMANABADI DOES

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Abstract: Comparative study was carried out to evaluate the effect of partial and complete replacement of field grown maize with hydroponic maize on haematological parameters in *Osmanabadi* does. The research was carried out for the duration of 90 days on 21 *Osmanabadi* does in Sheep and Goat unit of NVC, Nagpur. There were three treatment groups of *Osmanabadi* does for the study. Group 1 was fed with 100% field grown maize + Dry + Concentrate; Group 2 was fed with 50% field grown maize + 50% Hydroponically grown maize + Dry + Concentrate and Group 3 was fed with 100% Hydroponically grown maize + Dry + Concentrate. The average value of RBC, 9.74 ± 0.05 , 10.05 ± 0.03 and 10.21 ± 0.04 in group 1, group 2 and group 3 respectively, found to be significant ($P < 0.01$). The average value of WBC 6.54 ± 0.10 , 6.63 ± 0.10 and 6.86 ± 0.07 in group 1, group 2 and group 3 respectively, found to be significant ($P < 0.05$). However, the average value of Hb 10.81 ± 0.22 , 10.87 ± 0.25 and 10.88 ± 0.21 in group 1, group 2 and group 3, respectively found to be non-significant. Overall, study indicated that the positive effect of feeding of hydroponic maize on the health of *Osmanabadi* does.

Keywords: Comparison, hydroponic maize, field grown maize, haematology, *Osmanabadi* does.

Introduction

Sprouting grain is one of the important nutritionally rich sources of feed used in feeding management of animals. The composition of most important macronutrients in grains i.e. Protein, starch and lipids hydrolysed and converted into simpler form due to activated enzymes during the process of germination and sprouting (Dung et al., 2010).

Maize is one of the plants containing abundant source of energy and proteins in its seeds and their product that can be well utilized by the animals. However, the maize, barley, oats and other variety of the grains are used to produce the hydroponics green fodder. In hydroponically grown maize, the carbohydrate, protein and lipids breakdown into simpler compounds by advantageous chemical and structural changes for cell wall synthesis and stem growth. During the process of germination, the number of sprouts produced and the quality of

hydroponic maize is influenced by physical, biological and chemical factors such quality, variety and treatment of the grains, environmental factors like temperature, humidity and incidence of the mould, pH and water quality, soaking time, nutrient supply, depth and density of grains in trays and the growing duration (Sneath and McIntosh, 2003). During the animal feeding management, in production of field grown fodder farmers are facing so many constraints including availability of the labours, small land holding (Naik *et al.*, 2014). In comparison to field grown fodder, hydroponic fodder has gained significance due to the ability of the hydroponic fodder production system to deliver the known quantity of green feed every day in spite of seasonal variation such as dry, wet or cold climate. In this context, the experiment was conducted to compare the haematological parameters by feeding field and hydroponically grown maize to the *Osmanabadi* does.

Materials and Methods

The 90 days duration experiment from month of February to May 2018, conducted at Sheep and Goat unit of Cattle Breeding Farm, NVC Nagpur. The experimental period was followed by post experimental period during which the animals were returned to their routine feeding schedule as per earlier existed at the farm. Total 21 adult *Osmanabadi* does who were similar in age, body weight and body sizes were selected for the experiment. The average age of the selected does was between 4-5 years. The scientific deworming of all selected does was carried out before the start of experiment.

To make the necessary comparison of hydroponic maize and field grown maize feeding on haematological parameters in does, the required feed like hydroponic maize was cultivated in fully mechanized and automated hydroponic unit whereas, the field grown maize was cultivated on the available land of the farm. The hydroponic maize was grown in controlled conditions by using metal tray of size, 90 x 30 x 4 cm. Each tray in the hydroponic unit was loaded with 1 kg of sprouted maize seeds and kept for the duration of 7 days for further growth. The Proximate analyses of feed and fodder was carried out as per AOAC 1990, during the experiment.

There were three treatment groups in experiment. The Group 1 was fed with 100% field grown maize + Dry + Concentrate; Group 2 was fed with 50% field grown maize + 50% Hydroponically grown maize + Dry + Concentrate while, Group 3 was fed with 100% Hydroponically grown maize + Dry + Concentrate. The each component of feed was fed to the experimental animals twice a day i.e. in morning and evening hours with an interval of one hour between two components. To estimate the haematological values for RBC, WBC

and Hb blood sample was collected fortnightly from the experimental does in morning hours. About 6 ml blood sample was collected from each of the does. The 4 ml blood was collected in clot activator vial for serum separation while 2 ml blood was collected in clean EDTA vials. The collected blood samples were kept on the ice packs and immediately carried to the laboratory for processing. The blood serum was separated from 4 ml blood sample within 4 to 5 hours of and stored in deep freeze for further analysis. However, the CBC estimation was carried out to measure the haematological parameters i.e. RBC, WBC and Hb by using CBC kit, ABX Vetpack and auto analyzer, i.e. Horiba machine. The total leukocyte count was expressed in thousands/micro litre, the total erythrocyte count was expressed in million/microlitre and the haemoglobin was expressed in gm/dl.

Results and Discussion

1. Proximate analysis of different feed and fodder

It is observed from Table 1 that on the basis of dry matter, the crude protein level of the hydroponic maize was found to be higher than the field maize. The dry matter was more in the dry straw and the concentrate mixture followed by the field maize and least in the hydroponic maize. The losses in the dry matter during soaking and germination are due to the depletion in the nutrient reserve of the seeds which they mostly use for their growth.

Table 1: Proximate analysis of different feed and fodder

Sr. No.	Proximate principles (%)	Feed ingredients			
		Hydroponic maize fodder	Field maize fodder	Concentrate mixture	Dry straw
1	DM	15.15%	17.1%	97.03%	97.27%
2	CP	10.5%	4.37%	13.75%	2.62%
3	CF	28.00%	31.58%	14.1%	61.25%
4	EE	2.9%	1.86%	3.2%	1.06%
5	NFE	50.5%	53.53%	60.55%	26.47%
6	Total Ash	8.10%	8.65%	8.4%	8.6%

It is also observed that the crude protein (CP) and ether extract (EE) count in the hydroponic maize was comparatively higher than reported by Fayed (2011) who found CP and EE to be 8.07% and 1.55, respectively whereas, Chichame and Chahande (2017) reported that the CP - 8.87 and higher EE 4.30. However the CP and EE level was reported lower than that of Thomas and Reddy (1962) who observed that CP was 17%, whereas, Naik *et al.* (2012) reported that the CP- 13.57%, EE- 2.49 and Limba (2015) observed that the CP-18.37 and

EE-3.50 in hydroponic maize. The difference in the opinion as recorded above might be due to the variation in the laboratory procedure or the samples subjected to laboratory analysis.

2. Analysis of variance to see the effect of treatment on haematological Parameters

The results of analyses of variance to see the effect of different treatments on haematological parameters are shown in Table 2.

Table 2: Analysis of variance to see the effect of treatment on haematological Parameters

	RBC		WBC		Hb	
SV	df	mss	df	mss	df	mss
Treatment	2	2.902 ^{**}	2	1.308 [*]	2	0.068 ^{NS}
Error	144	0.075	144	0.402	144	2.594
Total	146		146		146	

Note: NS = non- significant, * = (P<0.05), ** = P<0.01

3. Average of RBC within treatment groups:

The mean values of RBC are presented in table 3.

Table 3: Average \pm SE of RBC (millions/micro litre) within treatment groups

RBC	n	F1	F2	F3	F4	F5	F6	F7	Total
Gr 1	7	9.65 ± 0.11	9.67 ± 0.11	9.65 ± 0.11	9.83 ± 0.14	9.77 ± 0.12	9.79 ± 0.12	9.80 ± 0.12	9.74 ^c ± 0.05
Gr 2	7	9.95 ± 0.06	9.99 ± 0.05	9.97 ± 0.06	10.08 ± 0.08	10.08 ± 0.07	10.16 ± 0.08	10.16 ± 0.07	10.05 ^b ± 0.03
Gr 3	7	10.01 ± 0.08	10.10 ± 0.07	10.10 ± 0.05	10.24 ± 0.12	10.27 ± 0.09	10.31 ± 0.09	10.48 ± 0.11	10.21 ^a ± 0.04
CD									0.108
Pooled	21	9.87 ± 0.06	9.92 ± 0.06	9.90 ± 0.06	10.05 ± 0.08	10.04 ± 0.07	10.09 ± 0.07	10.14 ± 0.08	10.00 ± 0.03

Note: the values bearing different superscripts differ significantly (P< 0.01) within columns

The useful effects of hydroponic maize over field maize can be seen by numeric but steady increase in the RBC level in the Group- 3 10.21 \pm 0.04 followed by Group- 2 10.05 \pm 0.03 and least in the Group- 1, 9.74 \pm 0.05 with significant difference of P < 0.01. The RBC was expressed in millions/micro litre and the interval was of 15 days. Marsico *et al.* (2009) and Micera *et al.* (2009) found that hydroponic maize has no significant effect on the

haematological values. Chichame and Chahande (2017) also observed the beneficial effects of feeding of hydroponic fodder to the does in terms of increasing the level of RBC than the non supplemented group.

4. Average of WBC within treatment groups

The mean values of WBC are presented in table 4.

Table 4: Average \pm SE of WBC (thousands/micro litre) within treatment groups

WBC	n	F1	F2	F3	F4	F5	F6	F7	Total
Gr 1	7	6.49 ± 0.27	6.52 ± 0.25	6.55 ± 0.24	6.58 ± 0.26	6.53 ± 0.23	6.51 ± 0.24	6.59 ± 0.28	6.54 ^c ± 0.10
Gr 2	7	6.56 ± 0.28	6.56 ± 0.26	6.58 ± 0.26	6.66 ± 0.27	6.64 ± 0.27	6.68 ± 0.28	6.73 ± 0.27	6.63 ^b ± 0.10
Gr 3	7	6.79 ± 0.18	6.88 ± 0.17	6.77 ± 0.16	6.92 ± 0.18	6.90 ± 0.17	6.84 ± 0.16	6.89 ± 0.19	6.86 ^a ± 0.07
CD									0.251
Pooled	21	6.62 ± 0.15	6.66 ± 0.14	6.63 ± 0.13	6.72 ± 0.14	6.69 ± 0.13	6.68 ± 0.14	6.73 ± 0.15	6.68 ± 0.05

Note: the values bearing different superscripts differ significantly ($P < 0.05$) within columns

It is observed from Table 4 that the WBC count was more in the Group- 3, i.e. 6.86 ± 0.07 with the least observation in the Group- 1, 6.54 ± 0.10 and intermediate in the Group- 2 6.63 ± 0.10 and all the results was within the normal range with the values found to be significantly different ($P < 0.05$) in all the three treatment groups. The WBC count was expressed in the thousands/micro litre which was estimated at 15 days interval. Marsico *et al.* (2009) and Micera *et al.* (2009) reported that no significant effect on the haematological values. Chichame and Chahande (2017) found that there was increase in the WBC concentration when fed with the hydroponic maize as compared to their control group. This finding is in according to the present research.

5. Average of Haemoglobin within treatment groups:

The mean values of Haemoglobin are presented in Table 5.

Table 5: Average \pm SE of Hb (g/dl) within treatment groups

Hb	n	F1	F2	F3	F4	F5	F6	F7	Total
Gr 1	7	10.57 ± 0.58	10.74 ± 0.57	10.77 ± 0.56	10.88 ± 0.55	10.88 ± 0.61	10.96 ± 0.60	10.87 ± 0.64	10.81 ± 0.22
Gr 2	7	10.58 ± 0.61	10.66 ± 0.59	10.62 ± 0.63	10.95 ± 0.68	10.89 ± 0.67	11.19 ± 0.67	11.22 ± 0.67	10.87 ± 0.25
Gr 3	7	10.53 ± 0.44	10.59 ± 0.47	11.35 ± 0.89	10.88 ± 0.47	10.93 ± 0.45	10.93 ± 0.48	10.96 ± 0.52	10.88 ± 0.21
Pooled	21	10.56 ± 0.32	10.66 ± 0.32	10.91 ± 0.41	10.90 ± 0.33	10.90 ± 0.34	11.03 ± 0.34	11.02 ± 0.35	10.85 ± 0.13

It is observed that during the experiment there was an increase trend in the level of Hb in the group supplemented with 100% hydroponic maize i.e. Group 3 (10.88 ± 0.21) followed by the group supplemented with 50% hydroponic maize and 50% field maize i.e. Group 2 (10.87 ± 0.25) and the least level of Hb was observed in the group supplemented with 100% field maize i.e. Group 1 (10.81 ± 0.22) shown non significant statistical variation. These findings is supported by Chichame and Chahande (2017) who also reported that an increase in Hb level due to feeding of hydroponic maize in goat. However, this findings also supports the hypothesis laid to the present investigation that the sprouting and hydroponics grown maize leads to the improvement in the Hb level, which is one of the indications of the health of the animals. Hence it reveals from the study that hydroponic fodder in goat ration is beneficial with respect to health of the animals. The differences within the treatment groups was non-significant, however, the hypothesis needs further to be substantiated with more work.

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