Journal of Entomology and Zoology Studies

Available online at www.entomoljournal.com

E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2017; 5(4): 1301-1303

Received: 15-05-2017
Accepted: 16-06-2017

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Effect of stocking density on the performance of New Zealand white breed of broiler rabbit in Assam

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Abstract
Twenty-four weaned New Zealand White (NZW) rabbits of six week old having uniform size and body weights were selected. Animals were randomly divided into three groups. The groups were nomenclature as GI, GII and GIII having four, eight and twelve rabbits in each group and the evaluated densities were: 0.38m^2/rabbit; 0.19m^2/rabbit and 0.12m^2/rabbit, respectively. The animals were maintained on same basal diet and weekly body weights, body weight gains, feed consumption, feed conversion ratio are recorded. The study revealed that the rabbits providing 038m^2 floor spaces per animal showed better performance in terms of body weights, body weight gains and feed conversion ratio under the climatic condition of Assam.

Keywords: Rabbit, stocking density

Introduction
Rabbit can play a major role in enhancing animal protein production in developing countries due to its various biological advantages. Small-scale rabbit units can produce meat for the family using local breed and the bulk of the feed consists mostly of weeds, natural grasses and leaves of trees and crop by-products as well as kitchen wastes. As competition between human and livestock for grains intensifies, rabbit will have a competitive advantage over swine and poultry, since these animals cannot be raised on high roughage diet or diets that do not contain grain. The ability of the rabbit to convert forage into meat efficiently will be of special significance in developing countries like India.
It is established that high stocking density reduces the cost of production in any livestock enterprise. However, excessive density might affect the performance of animals. Therefore, it is important to know the optimum stocking density without affecting various production parameters which in turn will increase the profitability.

Materials and Methods
The study was conducted on 24 weaned NZW rabbits of six weeks of age with uniform body weight. The animals were randomly divided into three groups of 4, 8 and 12 rabbits and kept in three identical netted cubicles with concrete floor of size 1.30 m x 1.16 m. The groups were nomenclature as G-I, G-II and G-III with space allocation per rabbit as 0.38m2, 0.19m2 and 0.12m2 respectively. The rabbits received ad libitum concentrate in the morning and green fodder in the evening with the following composition:

Type of feed	Moisture	Crude Protein	Ether Extract	Crude fibre
Concentrate	10.0%	15.68%	7.12	11.37%
Green fodder	74.0%	8.06%	1.93	8.04%

Feed leftover was weighed next day before offering new feed in the morning to estimate the actual amount of feed consumed. Wholesome drinking water was provided round the clock. The body weights of rabbits were recorded initially at 6 weeks and thereafter at weekly interval up to the age of 13 weeks. From the body weight records, weekly body weight gains were calculated. The feed conversion ratios (FCR) were worked out at weekly intervals on the basis of the dry matter of the feed required against the body weight gains. The data were analyzed as per standard statistical procedure.

Results and discussion

The values of weekly body weights are presented in the Table.1, which suggests that group G-I, G-II and G-III rabbits at 6 and 7 weeks had no significant difference and the findings were in agreement to the findings of Princz *et al.* (2008) [5] who reported that stocking density had no effect on the productive parameters of growing rabbits. In the six recordings from 8 to 13 weeks, the weekly body weights of G-I rabbits did not exhibit any significant difference with the G-II category. However, the weekly body weights of G-I rabbits differed significantly ($P<0.05$) from that of G-III rabbits. Moreover, the body weights of G-II rabbits also differed significantly from G-III rabbits. It may be explained by the fact that higher stocking densities exert stress to the animals, affecting their growths. The findings of Kalaba (2012) [3] and Das *et al.* (2007) [1] corroborate the results of the present study.

Table 1: Body weights (g) of New Zealand White (NZW) rabbits

Group	6th week	7th week	8th week	9th week	10th week	11th week	12th week	13th week
GI	697.25 ± 9.18	757.50 ± 8.62	829.62 ± 9.84^{a}	907.75 ± 11.00^{a}	992.50 ± 10.17^{a}	1087.75 ± 9.90^{a}	1185.00 ± 10.30^{a}	1283.62 ± 10.47^{a}
GII	708.19 ± 7.58	769.00 ± 7.14	840.31 ± 7.35^{a}	917.44 ± 7.36^{a}	998.25 ± 7.16^{a}	1086.69 ± 7.81^{a}	1177.87±8.41^{a}	1271.50± 8.99^{a}
GIII	704.37 ± 3.52	763.67 ± 3.36	822.75 ± 3.16^{c}	889.83 ± 3.34^{c}	959.00 ± 4.49^{c}	1038.71 ± 4.82^{c}	1123.00± 4.86^{c}	1211.12± 4.73^{c}

The values of weekly body weight gains as shown in Table. 2 revealed that on 8th week, G-I and G-II had no significant difference. However, the body weight gains of G-I and G-III as well as G-II and G-III varied significantly ($P<0.05$). From 9th week onwards up to 13th week the body weight gains differed significantly in all the three experimental groups. From the results it can be said that as the animals increased in their body weights, the space allocation proportionately decrease which was reflected from the altered gains in body weights from 9th week onwards. This suggests that minimum space allotment per rabbit is dependent on the body weights of the animal at that point of time.

Table 2: Body weight gains (g) of New Zealand White (NZW) rabbits

Group	7th week	8th week	9th week	10th week	11th week	12th week	13th week
GI	60.25 ± 1.16^{a}	72.12 ± 2.87^{a}	78.12 ± 1.18^{a}	84.75 ± 1.09^{a}	95.25± 1.36^{a}	97.25 ± 0.60^{a}	98.62 ± 0.61^{a}
GII	60.81 ± 1.42^{ab}	71.31 ± 0.87^{ab}	77.12 ± 0.59^{ab}	80.81± 0.60^{b}	88.44 ± 1.39^{b}	91.19 ± 1.43^{b}	93.62± 1.15^{b}
GIII	59.29 ± 0.47^{abc}	59.08 ± 1.08^{c}	67.08 ± 1.60^{c}	69.17± 1.60^{c}	79.71± 0.88^{c}	84.29 ± 0.49^{c}	88.12± 1.19^{c}

Figures with same superscripts in a column does not differ significantly

The average quantity of feed consumed per animal from 6 to 13 weeks in G-I was 491.43±28.78 g. Corresponding figures for G-II and G-III were found as 496.15±28.82 g and 500.16±27.56 g respectively. The amount of overall feed consumed in all the three groups did not differ significantly. Showing that, stocking density had no affect on feed consumption. Trocino *et al.* (2004) [6] and Oliveira *et al.* (2002) [4] reported that stocking density had no overall effect on feed intake which is in agreement with the present findings.

Table 3: Body weight gains, feed intake and feed conversion ratio of NZW

	Group I			Group II			Group III		
Age (Week)	weight gain (g)	Feed Intake (g)	FCR	weight gain (g)	Feed Intake (g)	FCR	weight gain (g)	Feed Intake (g)	FCR
7th	60.25	392.00	6.51	60.81	396.47	6.52	59.29	399.64	6.74
8th	72.12	425.31	5.90	71.31	428.56	6.01	59.08	439.54	7.44
9th	78.12	449.81	5.76	77.12	453.53	5.88	67.08	464.46	6.92
10th	84.75	485.81	5.73	80.81	494.28	6.12	69.17	496.02	7.17
11th	95.25	522.44	5.48	88.43	526.50	5.95	79.71	527.73	6.62
12th	97.25	556.87	5.73	91.19	562.56	6.17	84.29	564.00	6.69
13th	98.62	607.75	6.16	93.62	611.12	6.53	88.12	609.73	6.92
Overall	83.77±5.47	491.43±28.78	5.89±0.13	80.47±4.45	496.15±28.82	6.17±0.10	72.39±4.44	500.16±27.56	6.93±0.11

The average feed conversion ratio per animal from 6 to 13 weeks in NZW G-I was 5.89±0.13.Corresponding figure for G-II and G-III was 6.17±0.10 and 6.93±0.11 respectively. The values of G-III differed significantly from that of G-I and G-II, whereas group I and II showed no significant difference. The Feed conversion ratio of NZW in all the three groups ranged from minimum of 5.49 to a maximum of 7.44. The average Feed conversion ratio of G-I NZW rabbits appeared best, the value being intermediate in G-II and worst in G-III. The difference in Feed conversion ratio values may be attributed to the corresponding difference in body weights. Verspecht *et al.* (2003) [7] documented similar reports wherein they stated that stocking density effects body weight which in turn disturbs feed conversion ratio. Iyeghe *et al.* (2005) [2] reported that feed conversion ratio was poorer at higher stocking densities which is in agreement to the present finding.

Conclusion

The study was carried out on 3 groups of New Zealand White rabbits kept in cubicles of similar dimensions with stocking densities 0.38 m^2/ rabbit, 0.19 m^2/ rabbit and 0.12 m^2/ rabbit. The groups were nomenclature as G-I, G-II and G-III for the convenience of the study. The animals were maintained on same basal diet and weekly body weights as well as feed consumptions were recorded. The weekly body weight gains and feed conversion ratios were calculated out. The study revealed that the G-I rabbits showed better performance in terms of the productive parameters under the climatic condition of Assam.

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