

## **Graded levels of stocking density for turkey toms raised to 16 weeks of age**

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### **Introduction**

Stocking density can be one of the most important drivers of economic return; however it can greatly influence bird performance, health, and welfare. In regards to heavy turkey toms, there are few recent studies that take a comprehensive approach to stocking density. Increasing stocking density can negatively impact the environment (air quality and litter quality) which may in turn affect bird health. As a result, it is important to mitigate the effect of density on environment in attempt to remove any confounding factors. Past studies have reported negative effects of increasing stocking density on turkey tom performance, including body weight, feed consumption, and feed efficiency (Coleman and Leighton, 1969; Proudfoot et al., 1979; Denbow et al., 1984; Noll et al., 1991; Martrenchar et al., 1999). Although less frequently evaluated, increasing stocking density has also been associated with poor gait scores, increases in footpad lesions and behavioural differences (Martrenchar et al., 1999).

The aim of this study was to provide current, comprehensive data outlining the effects of graded levels of stocking density on turkey tom performance, health, and well-being.

### **Materials and Methods**

The experiment took place in two trials consisting of 1,434 Nicholas Select turkey toms. Each trial consisted of 2 room replicates of stocking density treatments (30, 40, 50, and 60 kg/m<sup>2</sup>) resulting in a total of 4 replicates per treatment. Birds were housed in large open rooms (6.71m x 10.06m) that were equipped with individual environmental controls. Air quality was monitored to assist in managing the ventilation to ensure consistent air quality across treatments. Body weight and feed intake were recorded at 4, 8, 12, and 16 weeks of age. Mortality was recorded daily and flock uniformity was assessed at week 12 and 16. Health and welfare parameters were assessed at 12 and 16 weeks of age and included footpad lesion scoring, gait scoring, feather condition and cleanliness scoring, heterophil to lymphocyte ratio (H/L ratio), incidence of aggressive damage, and behaviour.

### **Results and Discussion**

The results presented in these proceedings are for week 16 only, additional results can be found in Beaulac and Schwean-Lardner (2018) and Beaulac et al., (Poultry Science - in press). Bird performance (Table 1) was negatively impacted by increasing stocking density. Overall body

weight gain from 0-16 weeks decreased linearly as stocking density increased ( $P=0.01$ ). This decrease in body weight has been observed in previous studies with increasing stocking density (Proudfoot et al., 1979; Denbow et al., 1984; Noll et al., 1991). Feed consumption and feed efficiency were both negatively impacted by increasing stocking density within the last 4 weeks, however only feed efficiency was negatively impacted over the course of the entire trial (0-16 wks). Feed efficiency is not consistently affected by increasing stocking density, with certain studies showing no differences (Coleman and Leighton, 1969; Proudfoot et al., 1979) and other studies indicating significant decreases in feed efficiency (Denbow et al., 1984; Noll et al., 1991). Total mortality (Table 1) and flock uniformity (not shown) was unaffected by increasing stocking density. While mortality was not significantly different in this study, two other studies have noted numerically high mortality in relation to high stocking density (Coleman and Leighton, 1969; Noll et al., 1991).

**Table 1.** Impact of estimated final stocking density on turkey tom performance to 16 weeks of age

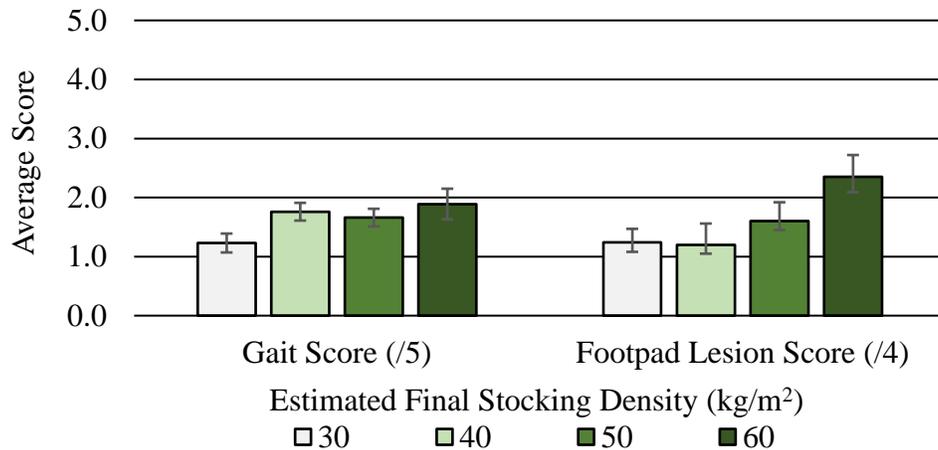
Age (wk)	n	Estimated final stocking density (kg/m <sup>2</sup> )				SEM <sup>1</sup>	Regression		Regression Equation <sup>2</sup>
		30	40	50	60		P-value	R <sup>2</sup>	
<i>Body weight gain (kg)</i>									
12-16	4	6.19	6.06	5.94	5.73	0.070	0.01 <sup>L</sup>	0.38	Y=-0.02x+6.66
0-16	4	18.72	18.65	18.49	18.07	0.098	0.01 <sup>L</sup>	0.39	Y=-0.02x+19.43
<i>Feed consumption (kg)</i>									
12-16	4	20.34	19.54	19.47	19.25	0.186	0.04 <sup>L</sup>	0.26	Y=-0.03x+21.15
0-16	4	44.24	43.57	43.51	43.35	0.210	NS	-	-
<i>Feed efficiency (feed:gain mortality corrected)</i>									
12-16	4	3.20	3.21	3.27	3.35	0.027	0.03 <sup>L</sup>	0.29	Y=0.51e <sup>-2</sup> x+3.03
0-16	4	2.29	2.29	2.31	2.35	0.010	0.02 <sup>L</sup>	0.35	Y=0.20e <sup>-2</sup> x+2.22
<i>Mortality and culls (%)</i>									
12-16	4	6.8	6.2	4.2	5.5	0.52	NS	-	-
0-16	4	14.1	12.6	10.2	13.4	0.84	NS	-	-

<sup>1</sup>Standard error of the mean.

<sup>2</sup>Regression considered significant if  $P \leq 0.05$ .

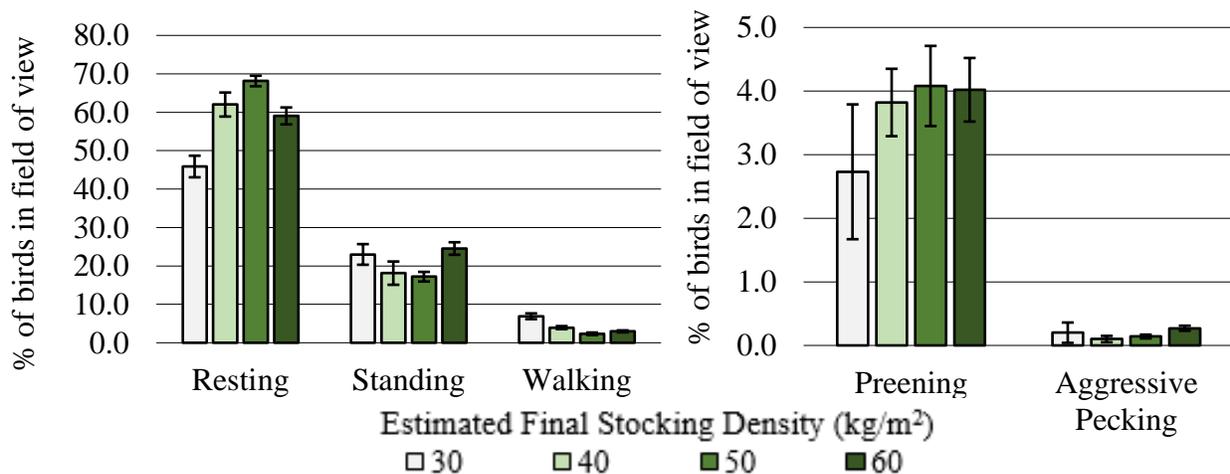
<sup>L</sup>Linear regression is significant

When evaluating health parameters, we observed an increase in footpad lesion score severity ( $P=0.02$ , linear) and in gait score ( $P=0.04$ , linear), as an indicator of lameness, as stocking density increased (Figure 1). Footpad lesions and gait score have not been evaluated frequently in relation to increasing stocking density; however Martrenchar et al. (1999) also observed a higher incidence of footpad lesions and poorer gait as stocking density increased in both hens and toms. In addition, both feather cover ( $P=0.01$ , linear) and feather cleanliness ( $P<0.01$ , linear) were poorer as stocking density increased at 16 weeks of age. The H/L ratio was not impacted by increasing stocking density at older ages (12 and 16 weeks; Beaulac and Schwan-Lardner, 2018).



**Figure 1.** Impact of estimated final stocking density on average gait score and average footpad lesion score of turkey toms at 16 weeks of age. Gait score 0 is no impairment and score 5 is complete lameness (Garner et al., 2002; Vermette et al., 2016). Footpad lesion score 0 is no external signs of a lesion and score 4 is greater than 50% of the footpad covered with necrotic cells (Hocking et al., 2008).

Turkey tom behaviour (Figure 3) was impacted by increasing density, with resting ( $P<0.01$ , quadratic), standing ( $P=0.01$ , quadratic), walking ( $P=0.02$ , quadratic), preening ( $P=0.02$ , linear), and aggressive pecking ( $P=0.04$ , linear) differing by treatment. Birds housed at low stocking densities were more active and were seen resting less, however they also showed an increase in aggressive behaviours. Birds at moderate densities (40 and 50 kg/m<sup>2</sup>) were less active, less aggressive, and were observed more frequently resting and preening.



**Figure 3.** Impact of stocking density on turkey tom behaviour at 16 weeks of age

In conclusion, high stocking density, while economically beneficial, decreases bird performance and may pose a risk to bird health and welfare.

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