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Transportation of broilers: An issue of welfare

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Abstract
Broiler industry is the one of the fastest growing sectors in India. Approximately 4.2 million metric tonnes of broiler chicken meat is currently produced in India. Poultry chicken meat production increased from 0.79 million tons to 4.2 million tons during the year 1980 and 2017 (Livestock Census). The proportion of broiler chickens dead on arrival (DOA) has been reported to vary from around 0.15% to 0.67% (Mitchell, 2006) [7]. Transportation is considered a major stressor for broilers and might have deleterious effects on health, well-being, performance, and product quality. Transportation stress not only affects the chicken welfare but also decrease the quality of chicken and meat.

Keywords: Broilers, transportation, catching and crating, chicken welfare

1. Introduction
Broiler industry is the one of the fastest growing sectors in India. Approximately 4.2 million metric tonnes of broiler chicken meat is currently produced in India. Poultry chicken meat production increased from 0.79 million tons to 4.2 million tons during the year 1980 and 2017 (Livestock Census) Per capita availability also increased from 0.27 kg to 3.6 kg during the same year. The major contributor's states to the output of broiler chicken meat during 2017 are Tamil Nadu, Andhra Pradesh, Maharashtra and Haryana. Broiler chicken rearing is mostly being carried out in the form of an intensive system in different geographical areas and to be transported by road over a long distance to urban areas or centralized processing plants. Transportation is an essential component of the poultry industry, but places enormous stress on birds because they have little space for behavioural thermoregulation. In particular, exposure to harsh weather conditions might cause suffering or death of birds from heat or cold stress (Hunter *et al.*, 2001) [4].
Handling and transportation can cause stress to birds, ranging from mild discomfort, morbidity and aversion to death (Schwartzkopf-Genswein *et al.*, 2012) [11]. The proportion of broiler chickens dead on arrival (DOA) has been reported to vary from around 0.15% to 0.67% (Mitchell, 2006) [7]. Transportation stress not only affects the chicken welfare but also decrease the quality of chicken and meat.

2. Welfare issues associated with transportation stress
All the practices involved in transportation and microenvironment prevailing in container and vehicle may impose varying degree of stress upon the birds which compromises their welfare status, health and productive efficiency depending upon the magnitude of challenge imposed. The main factors involve in welfare of birds and carcass quality during their transportation from farm to slaughter house are

- Withdrawal period of feed prior and during transportation.
- Catching and crating of broiler for transportation.
- Exterior environment and microenvironment around broilers loaded on truck.
- Loading density in crates on truck and lairage period before slaughter.

2.1 Feed withdrawal
The fasting or feed withdrawal referred to the total length of time birds are without feed before processing, including the time birds are in the farm without feed as well as during transportation. Feed withdrawal is necessary to decrease the chances of contamination by faeces during transportation and in slaughterhouse. The length of fasting is important because it affect carcass yield (live weight). Warriss *et al.* (2005) [14] recommended length of time without feed for birds before slaughter is between 8 to 12 hours, as this allow the majority of

flock to evacuate remaining faecal matter and minimize the negative effect on body weight and carcass. Bird loss about 0.18 % body weight per hours during the withdrawal period to a maximum of 0.42% (Nijdam *et al.*, 2005) [8]. In the first 4-6 hours body weight loss in bird is mainly due to gastric emptying, so carcass yield is not negatively influenced. After 6 hours there are losses of moisture and nutrients from body tissues which decreases carcass yield of saleable product (Warris *et al.*, 2005) [14]. At high ambient temperature body loss is greater**.**

2.2 Catching and crating

Catching and crating is the first task to be carried out for transportation of broiler. Rough and speedy catching and crating may badly influence birds welfare, and downgrade carcass due to physical injury, bruises, haemorrhages, broken bones and even mortality. In such cases serious welfare issue that can exacerbated by catching and handling procedure.

Manual catching at many small farms broilers are caught almost entirely by hand, holding 3 to 5 broilers by legs in inverted position in each hand (Nijdam *et al.*, 2005) [8]. The work is physical demanding task and also carried out in dusty and dirty environment. Under these situations many a times, it could be difficult to maintain concentration, and exercise care throughout a longer catching time and sometimes faster catching become major focus and careful handling become secondary. A study shows 20-25 % injury and bruising on breast, thigh and wing caused by rough catching and handling. Griffith and Nairn, (1984) [3] reported that about 40% of bruises were due to catching and crating activity. Besides bruising catching and crating may lead to death on arrival (DOA) which may range from 0.05 to 0.5% (Nijdam *et al.*, 2005) [8].

Mechanical catching of broilers is practised at many large farms. These mechanical harvester gathered birds with soft rubber finger rotors and pull them to conveyer belt to carry them in crate modules on truck. Mechanical catching reduce physical contact of birds with worker. Bird are handle upright and move on gently to crate them. Duncan *et al.* (1986) [1] reported that mechanical harvesting is less stressful to broilers as measured by heart rate and duration of tonic immobility. There were fewer bruises mechanical caught broiler reported by Knierim and Gocke, (2003) [6]. Disadvantage of mechanical catching and crating is that automatic harvester may less likely to remove dead, sick and weak birds and sometimes may cause for increase death on arrival (DOA) at slaughter house. Secondly trained and experienced operator as well as efficient operating working machine require to improve welfare and DOA.

2.3 Broiler transportation cage model

For better crating and transportation different type cage model used. The basic model has a top sliding door (40 X 36 cm). Front and side doors are also available upon request. Ideal dimensions of Broiler transportation cage (cm) 95.5 x 57 x 32.5h for 8.5 kg weight and 18 to 20 chickens capacity

2.4 Temperature

Among the many stress during transportation, thermal challenge constitute the main threat to the birds welfare and survival. The effect of thermal stress may be exacerbated by extended withdrawal of feed, water, density on loading, distance and duration of transportation. Problems of heat stress may be markedly exacerbated even in open or semi open vehicles, particularly when stationery in hot and humid weather condition. Increased polypnea or panting at high temperature causes accumulation of water and compromise its efficient evaporative heat loss and increases thermal load upon birds a vicious cycle start. It has been calculated that increased relative humidity from 20-80 % at temperature of 30 ^{0}C in a transport crate would result in a thermal load equivalent to additional rate of rise in core temperature of 0.42 ^{0}C per hour.

Transportation of broiler result in average mortality of 0.3 to 0.4% and mortality rate increased with the length of journey (Petracci *et al.*, 2006) [9]. Hunter *et al.* (2001) [4] examined the distribution of mortality of commercial broiler transport vehicle and reported significant link between the 'on board' thermal microenvironment and DOA value. Vecerek *et al.* (2006) [12] indicated that short journey (up to 50 km) associated with relative low mortality (0.15%) but for journey up to 300 km or greater the mortality increase to 0.86 %.

Table 1: No. of broiler (%) died during transport to processing plant in relation to season

Author	Season				Distance
	Summer	Spring	Winter	Autumn	
Vecerek *et al.* (2006) [12]	0.42%	0.39%	0.28%	0.23%	Average 120 km and time 90 minutes
Petracci *et al.* (2006) [9]	0.47%	0.32%	0.35%	0.28%	

Table 2: No. of broiler (%) died during transport to processing plant in relation to transport distance

Authors	Short journey up to 50 km	Long journey up to 300 km
Vecerek *et al.* (2006) [12]	0.15%	0.86%
Voslarova *et al.*(2007) [13]	0.15%	0.68%

Table 3: Body weight loss (%) in relation to transportation distance

Distance travelled	105 km	90 km	35 km	20 km	Author
Body weight loss	3.9%	3.3%	2.1%	2.6%	Petracci *et al.* (2006) [9]

2.5 Stocking density

Density of crated broiler plays a major role in the ability of broiler to cope as a homeotherm animal with environmental changes during transportation. Stocking density also depends on whether condition, total live weight of birds, and age of bird to be transported (Elron, 2000) [2]. In most vehicle ventilation is passive and is impeded by the close stocking density of adjacent crate. In such condition there is high probability of thermal stress being suffered by some birds 'on boards'. It is therefore important to reduce stocking density to control the built up heat and humidity (Warries *et al.*, 2005) [14].

Nijdam *et al.* (2005) [8] reported that mortality during transportation is reduced from 0.22% to 0.16% from march to august in a plant, despite of increasing ambient temperature by reducing stocking density from average 17.3 to 15.8 birds per transport crate. High temperature and high humidity induced heat stress and subsequent increase in dead on arrival (DOA) rate of birds. Transportation at high density increases plasma corticosterone concentration. Stress was maximum at high crating density during transport, irrespective of whether bird were fed or feed withdrawal (Kannan and Mench, 1996) [5]. High crating density causes reduced concentration of plasma tri-idothyroxine and thyroxin hormone in heat stress broilers (Sahin *et al.*, 2001) [10].

3. Biosecurity during transportation

The transportation is an important factor should be organized to prevent disease transmission and keep birds healthy, comfortable during transportation. The role of bio-security during catching, loading and unloading is essential. The poultry should be transported by authorized transporters in vehicles and crates that have been well cleaned and disinfected after unloading and before leaving the slaughterhouse with effective disinfectant for Salmonella. Vehicle drivers and catching and loading team should be trained and informed in proper way that they understand the personal hygiene and are aware by which disease can be spread by hand, equipment and clothes.

4. Conclusions

The scientific approach should follow during transportation management to provide humane way of catching and crating the birds with trained persons to minimize stress and improve welfare. Practice all biosecurity measures to improve hygiene and prevent contamination during transportation. Mechanical catching and crating is alternate to reduce stress. Optimum transportation condition and acceptable limit for temperature and humidity for broiler in transport crates under commercial condition is require to improve welfare of birds. Along with this optimum stoking density and transport schedule minimizing journey duration would prove beneficial.

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