



## Original Article

# Comparative Study on the Growth Performance of Three Varieties of Guinea Fowl (Pearl, White, Lavender) Under Intensive Rearing System in Hot Humid Climatic Condition

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ARTICLE INFO	ABSTRACT
<p><b>Article history</b>            Received: 27 Jul 2021            Accepted: 29 Oct 2021            Published: 31 Dec 2021</p> <p><b>Keywords</b>            Guinea fowl,            Color type,            Intensive,            Growth performance,            Survivability</p> <p><b>Correspondence</b>            Shubash Chandra Das            ✉: <a href="mailto:das.poultry@bau.edu.bd">das.poultry@bau.edu.bd</a></p> <p> OPEN ACCESS</p>	<p>The present study was conducted to compare the growth performances among three varieties (Pearl, White, and Lavender) of guinea fowl in intensive rearing system. A total of 135 day-old keets (45 from each variety) were considered for the study. After hatching, keets were separated on the basis of their plumage colors into three varieties i.e. Pearl, White and Lavender. In case of intensive rearing system, guinea fowl keets were reared with commercial feed (Starter diet: ME 2950 Kcal/kg, CP 21% for initial 2 weeks; Grower diet: ME 3050 Kcal/kg, CP 19% for rest of the experimental period) and the birds were kept without outdoor access. The results for feed intake, body weight, body weight gain and feed conversion ratio (FCR) for three varieties of guinea fowl were statistically significant (<math>p &lt; 0.05</math>) during the whole experimental period (0-20 weeks). Among three varieties, Lavender showed significantly (<math>p &lt; 0.05</math>) higher body weight (1549g/bird) followed by White (1403g/bird) and Pearl (1353g/bird). Feed intake was significantly (<math>p &lt; 0.05</math>) higher in Lavender (6317.61 g/bird) as compared to Pearl (6179g/bird) and White (6225g/bird) varieties. Similar to body weight, cumulative weight gains were also significantly highest in Lavender (1516g/bird), moderate in White (1370g/bird) and lowest in Pearl variety (1321g/bird). Improved feed conversion ratio (FCR) was calculated for Lavender (4.16) as compared to White (4.54) and Pearl (4.67) varieties. On the other hand, the survivability was comparatively higher in White (95%) than the other varieties. Taken together, it can be concluded that among the three varieties of guinea fowl, the Lavender showed better performance compared to White and Pearl varieties under intensive rearing system.</p>
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## Introduction

Poultry makes a substantial contribution to food security and nutrition providing energy, protein, and essential micro nutrients to humans with short production cycle (Mottet and Tempio, 2017). Considering world poultry population, chicken dominants over other poultry species which represents 63%, followed by ducks (11%), geese (9%), turkeys (5%), pigeons (3%) and guinea fowls (3%) (Besbes, 2009). In response to consumer preferences, some small or medium scale farmers in Bangladesh is being interested for rearing quail, geese, pigeon, guinea fowl or turkeys for income generation. Although, commercial broiler is the key of poultry meat production in Bangladesh, small and medium scale farms always struggle with the profitability of farming that results many of them shutting down their business. Recent report suggests

that the numbers of small and medium scale commercial layer and broiler farms reduced from 1,10,000 to 77,880 in the year of 2017 i.e., almost 35-40% farms had bound to close their operation due to the outbreak of avian influenza in 2007 (Hamid et al., 2017). In such situation, starting small scale guinea fowl farming could be a good choice for the farmers.

The potential for guinea fowl production as alternative to traditional chicken has been proven as one of the promising enterprises (Nahashon et al., 2005). Guinea fowl has a high socio-economic importance in the rural society, where it is mainly kept to supply meat, eggs and also family income for the poor farmers (Bonkougou, 2005). In many parts of the world, guinea fowls are raised mainly for their gamey flesh and eggs, which has a taste similar to other game birds and has many nutritional qualities. The meat of young guinea

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fowl is tender, lean and rich in essential fatty acids. Guinea fowl has a high meat yield, approximately 75-80% after processing with excellent meat to bone ratio (Ebegbulem and Asuquo, 2018). Many people raise guinea fowl for their unique ornamental values. Moreover, the birds can thrive well under harsh nutritional and environmental condition and also a good converter of scavangeable feedstuffs to high quality meat and eggs.

There are three varieties of guinea fowl recognized internationally namely Pearl, White and Lavender, of which the purplish colored Pearl is the most common and popular in across the globe. Although, there was the only variety of guinea fowl i.e. Pearl available in our country until 2016 however other two varieties i.e. White and Lavender were introduced thereafter by some enthusiastic farmers. Hatching performance and growth of Pearl variety were examined at BAU Poultry Farm and their genetic characterization was also described (Khairunnesa et al., 2016). Published information on the comparative growth performance of three guinea fowl varieties particularly under hot and humid climate are not available. The present study was therefore considered to focus on the comparative growth performance of Pearl, White and Lavender varieties of guinea fowl keeping in complete confinement under hot humid climatic condition and to recommend which of the guinea fowl varieties (Pearl, Lavender, and White) is most suitable and profitable under local environment of Bangladesh.

## Materials and Methods

### *Experimental design, birds and house management*

The present research was designed to investigate the comparative growth performance of three varieties of guinea fowl i.e. Pearl, White and Lavender for the period of 20 weeks under complete intensive rearing system. A total of 135 unsexed day-old keets, 45 from each of the varieties, were collected from the parent stock of BAU Poultry Farm and considered for this trial. Each variety was considered as a treatment and 45 birds from each variety again were distributed to three replicate groups having 15 birds per replication. During experimental period, temperature and humidity, feed intake, FCR, growth rate and bird's survivability were investigated. An open-sided semi-monitored type house was considered for brooding and rearing of experimental guinea fowls. The poultry house was cleaned, washed and disinfected properly and allowed to rest for at least 7 days prior to placement of the keets. Necessary equipment such as feeders, drinkers, brooders etc. were also cleaned and disinfected accordingly. The whole room area was sanitized with Virkon S, maintaining a ratio of 1:100 (1%), a common but widely used effective disinfectant purchased from local market. The experimental house was wire-netted

for brooding and growing as per standard requirement. Before placement of the keets, rice husk was provided as bedding material and jute sack was placed over the bedding materials for initial couple of days to avoid spraddle leg tendency of the keets. Brooder and brooder guard, feeders, drinkers, thermo-hyrometer and all other necessary equipment were properly placed prior to transfer the keets from hatchery to brooder house.

### *Brooding, feeding and watering of keets*

Just after hatching, keets were supplied with a dextrose monohydrate solution @ 50 g/L containing glucose, galactose and electrolyte. Temperature was maintained at 33°C for brooding and then decreased gradually in subsequent weeks @ 2.5°C/week until 4 weeks of age. The brooding of keets was performed at semi-monitored house with the floor space of 0.5 sq. ft./keet during brooding period, which was increased thereafter as per requirements. Because of the insignificant population, there was no commercial feed available in the market specifically produced for feeding guinea fowl. The farmers therefore preferred to use commercial broiler diet available in the market to feed the birds. In present study, guinea fowls were therefore fed commercial broiler starter diet with the nutrients of ME 2950 Kcal/kg and CP 21% for initial 2 weeks. Broiler grower diet (ME 3050 Kcal/kg, CP 19%) was supplied for rest of the experimental period. Feed and fresh clean drinking water were supplied as *ad-libitum* throughout the experimental period. Tray feeders (22cm×20cm) were used during brooding period and then round feeders were provided with the gradual advancement of age. Round drinkers were provided according to the age of keets. Feeders were cleaned every week and drinkers were cleaned every morning.

### *Immunization of birds*

Keets were vaccinated with IB+ND vaccine (CEVAC® BIL - contains the Massachusetts B48 strain of Infectious Bronchitis virus and the Hitchner B1 strain of Newcastle Disease virus in live, freeze dried form) at 1<sup>st</sup> day followed by a booster dose on 18<sup>th</sup> days of age through eye drop. Fowl pox vaccine was administrated at 35<sup>th</sup> days of age by puncturing the web of wing (w/w). Then, the birds were vaccinated with PoulShot® LaSota (LaSota Strain ≥106.6EID50) through drinking water at 50<sup>th</sup> days of rearing for immunizing against Newcastle disease. It contains Newcastle disease live virus propagated in specified-pathogen-free (SPF) chicken eggs.

### *Ventilation, lighting and litter management*

A provision of natural ventilation was ensured for the birds during entire experimental period. Experiment was started in winter but continued throughout the

summer period. A stand electric fan was used in summer to minimize extreme heat stress, when appeared. In the experimental period, 16 hours continuous light combining natural light and artificial lights with the intensity of 20-50 lux was given to the birds. Fresh and dry rice husk was used as litter materials with the thickness of 2 inches for the bird's comfort.

#### *Sanitization and biosecurity*

A strict but possible biosecurity measures were taken particularly in and around the experimental unit. Entrance of the personnel was completely prohibited to the research unit areas except the researcher. Potassium permanganate solution (1 g/L water) was used as disinfectant in the footbath. Further, TH<sub>4</sub><sup>+</sup> (Manufactured by- Sogeval, France) solution was sprayed over the floors, litter, equipment and machineries, walls, doorsteps and around the house premises once before placement of the keets, and then on regular basis. Before entering into the shed, disinfectant was sprayed on hands and foos every time. To avoid disease contamination, separate plastic sandals, apron, gumboot and hand gloves were used in routine care and management of the birds.

#### *Records keeping and data analysis*

Data on weekly average body weight, weekly average body weight gain, weekly average feed consumption, feed conversion ratio (FCR), vaccination and medication, and birds' survivability were recorded. The body weight gain was calculated by deducting initial body weight from the final body weight of the birds in every week. Quantity of feed offered to the birds were weight and recorded weekly. Residual feed was recorded to determine feed intake per birds. Finally, feed conversion ratio (FCR) was calculated weekly by dividing feed intake by weight gain. All these data collection activities were performed at the morning prior to feed and water supply to the birds. Then the recorded data were analyzed in one-way ANOVA procedure using SPSS 2013 software. Differences with *p*-values <0.05 were considered to be significant.

## **Results and Discussion**

### *Live body weight*

The cumulative live body weight of Pearl, Lavender and White varieties of guinea fowl reared under intensive system is shown in Table 1. All the experimental birds were fed iso-caloric and iso-nitrogenous diets and kept

under identical care and management. Results showed significant differences (*p*<0.05) in cumulative live body weight among the three varieties of guinea fowl at 5<sup>th</sup>, 10<sup>th</sup>, 15<sup>th</sup> and 20<sup>th</sup> weeks of age. Considering final live weight at 20<sup>th</sup> weeks, the Lavender attained significantly (*p*<0.05) higher body weight (1549g/bird) followed by White (1403g/bird) and Pearl varieties (1353g/bird). Almost similar results were reported by Singh (2015) who conducted a research work on the growth performance of three varieties of guinea fowl and found a significantly higher body weight in Lavender (1412g/bird) as compared to Pearl (1320g/bird) and White (1264g/bird) at 20<sup>th</sup> week of age. Lavender also showed significantly higher body weight (1455 g/bird) than other two color varieties, namely White (1431 g/bird) and Black (1331 g/bird) reared in deep litter management (Onunkwo and Okoro, 2015). Saina et al., (2005) reported an average body weight of 1450 g/bird at 16<sup>th</sup> weeks of age. In recent study, comparative growth performance of Pearl, Ash and Black genotypes of guinea fowls were examined at twenty-eight weeks of age by Fajemilehin (2010) and showed overall lower body weights of Pearl (980g/bird), Ash (970g/bird) and Black (950 g/bird) than the results of present study. Several previous reports confirmed the higher average body weight of Pearl variety (approx. 1600 g/bird) at 20<sup>th</sup> weeks of age (Saina et al., 2005; Nahashon et al., 2006; Khairunnesa et al., 2016). In recent study of Zeleke et al., (2020) mentioned almost similar body weight of the guinea fowls at 29<sup>th</sup> weeks of age kept in confined rearing.

Published reports however postulated comparatively lower body weights for Pearl variety (Dahouda et al., 2007; Mundra et al., 1993). Yamak et al., (2018) reported a significantly higher body weight of male guinea fowl (1241 g/bird) as compared to female (1158 g/bird) at 18<sup>th</sup> week of age but they mentioned no impact of rearing systems (indoor Vs free range) on the body weight. Taken all together, it can be assumed that the body weight of guinea fowl is associated with the genotypes of each variety, nutrients available in the diet, scavenging or confined system of rearing, disease prevention and other general managerial practices. In present study, the Lavender showed better body weight as compared to other two varieties might be because of its genetic superiority, as all other inputs were identical for the experimental birds.

**Table 1.** Changes in cumulative body weight (g/bird) at five-week interval ages of Pearl, Lavender and White varieties of Guinea fowl

Age (Weeks)	Cumulative body weight (g/bird) (Mean ± SE)			p value	LS
	Pearl	Lavender	White		
1	57.5±0.4	59.6±0.3	58.0±0.2	.05	NS
5	263.1 <sup>c</sup> ±0.8	296.0 <sup>a</sup> ±1.4	268.8 <sup>b</sup> ±0.4	.00	**
10	650.4 <sup>c</sup> ±0.6	719.0 <sup>a</sup> ±0.5	654.4 <sup>b</sup> ±0.7	.00	**
15	994.9 <sup>c</sup> ±0.8	1168.6 <sup>a</sup> ±4.6	1035.3 <sup>b</sup> ±0.7	.00	**
20	1353.2 <sup>c</sup> ±0.2	1549.7 <sup>a</sup> ±2.8	1403.7 <sup>b</sup> ±0.8	.00	**

<sup>a,b,c</sup> means with different superscripts within the same row differ significantly, value indicate: Mean ± Standard Error (SE); \*\*=Significant (p<0.05), Where, NS = Non-significant, LS= Level of Significance

### Body weight gain

Cumulative body weight gains at different ages for three varieties of guinea fowl are shown in Table 2. Body weight gain also showed significant (P<0.05) differences among the Pearl, Lavender and White varieties at 5, 10, 15 and 20 weeks of age. Similar to body weight, Lavender showed significantly (p<0.05) higher cumulative body weight gain at 20<sup>th</sup> weeks (1516 g/bird) of age compared to White (1370g/bird) and Pearl (1321g/bird). Adeyemo and Oyejola (2004) conducted experiment with guinea fowl on deep litter system and found a relatively lower body weight gain (825 g/bird) at 20<sup>th</sup> weeks of age. Birds raised by indigenous farmers in Zimbabwe under intensive

production system showed an average daily weight gain of 8 g/keet (Saina et al., 2005). Relatively higher average daily weight gain of 12.8-13.8 g/bird raised under intensive system of management was reported by Nobo et al., (2012). In present study, total body weight gains were examined for Lavender, Pearl and White varieties of guinea fowl and the data were presented in five-week interval, where Lavender showed the highest performance. Results of present study do not support the previous report of Singh (2015) who mentioned the White variety as best performer as compared to Lavender and Pearl.

**Table 2.** Changes in cumulative body weight gain (g/bird) at five-week interval of the Pearl, Lavender and White varieties of guinea fowl

Age (Weeks)	Cumulative body weight gain (g/bird) (Mean ± SE)			p value	LS
	Pearl	Lavender	White		
1	25.5±0.4	26.6±0.4	25.0±0.3	.06	NS
5	231.0 <sup>c</sup> ±0.7	263.0 <sup>a</sup> ±1.4	235.7 <sup>b</sup> ±0.4	.00	**
10	618.3 <sup>c</sup> ±0.6	685.9 <sup>a</sup> ±0.5	621.3 <sup>b</sup> ±0.7	.00	**
15	962.9 <sup>c</sup> ±0.8	1135.5 <sup>a</sup> ±4.6	1002.2 <sup>b</sup> ±0.7	.00	**
20	1321.2 <sup>c</sup> ±0.2	1516.6 <sup>a</sup> ±2.8	1370.7 <sup>b</sup> ±0.8	.00	**

<sup>a,b,c</sup> means with different superscripts within the same row differ significantly, value indicate: Mean ± Standard Error (SE); \*\*=Significant (P<0.05), Where, NS = Non-significant, LS= Level of Significance.

### Feed intake

The changes in cumulative feed intake at 1<sup>st</sup>, 5<sup>th</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 20<sup>th</sup> weeks of age for Lavender, White and Pearl varieties of guinea fowl are given in Table 3. Results showed significant (p<0.05) differences in overall cumulative feed intake among three varieties of guinea fowls, where the Lavender consumed higher amount of feed (6317.61 g/bird) at 20<sup>th</sup> weeks of age, followed by White (6225.94 g/bird) and Pearl (6179.13 g/bird), although the feed consumption rate was relatively higher in Pearl variety at beginning of the experiment. In recent study, Yamak et al., (2018) mentioned higher

amount of feed consumption at 18<sup>th</sup> weeks of age for the guinea fowls reared either in free range (7694 g/bird) or indoor (6984 g/bird). Mandal et al., (2004) however did not find any significant differences in feed consumption among White, Lavender and Pearl varieties at 12<sup>th</sup> weeks of age. Although, it remains unclear whether the genotypes have any impact on feed intake of the birds, however it may be possible that the better feed consumption of Lavender variety observed in present study might be associated with the higher body weight and body weight gain of that particular genotype.

**Table 3.** Changes in cumulative feed intake (g/bird) at five-week interval of the Pearl, Lavender and White varieties of guinea Fowl

Age (Weeks)	Cumulative feed intake (g/bird) (Mean ± SE)			P-value	LS
	Pearl	Lavender	White		
1	62.1 <sup>a</sup> ±0.5	51.4 <sup>b</sup> ±0.5	55.5 <sup>b</sup> ±0.2	.00	**
5	687.5 <sup>a</sup> ±1.8	674.7 <sup>b</sup> ±2.8	615.8 <sup>c</sup> ±1.5	.00	**
10	2027.9 <sup>a</sup> ±2.8	2020.6 <sup>a</sup> ±3.4	1923.2 <sup>b</sup> ±4.9	.00	**
15	3866.0 <sup>b</sup> ±6.7	3913.9 <sup>a</sup> ±2.9	3784.1 <sup>c</sup> ±11.3	.00	**
20	6179.1 <sup>c</sup> ±6.5	6317.6 <sup>a</sup> ±3.6	6225.9 <sup>b</sup> ±13.0	.00	**

<sup>a,b,c</sup>means with different superscripts within the same row differ significantly, value indicate: Mean ± Standard Error (SE); Where, \*\* =Significant (P<0.05), LS = Level of Significance

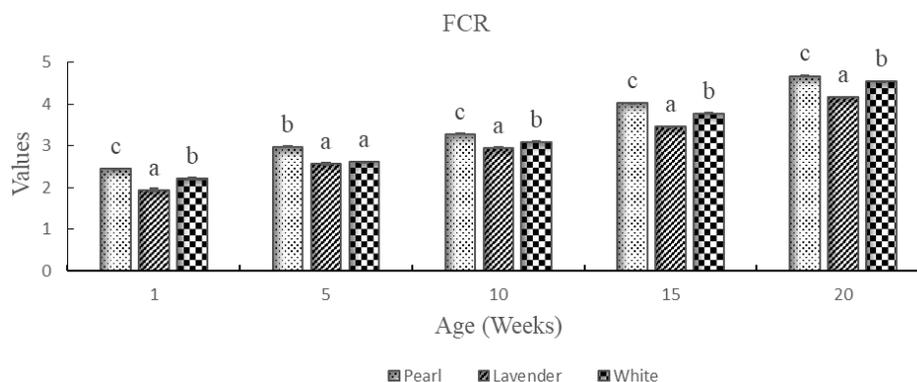
#### Feed conversion ratio

The feed conversion ratio (FCR) of three types of guinea fowl fed iso-caloric and iso-nitrogenous diet and reared under identical management is shown in Figure 1. Almost similar to the body weight, weight gain and feed consumption, significant differences ( $p<0.05$ ) were also found in FCR values for Pearl, Lavender and White varieties at 20<sup>th</sup> weeks of age, where the Lavender perceived lowest FCR value (4.16) followed by White (4.54) and Pearl (4.67). In present study, FCR values were also significantly lower in Lavender at 1, 5, 10 and 15<sup>th</sup> weeks of age. These results suggest that the Lavender utilized feed more efficiently and thus resulted significantly higher body weight and weight gain than that of White and Pearl. In recent study, Ebegbulem and Asuquo (2018) observed comparatively higher average FCR values of Black (5.14) and Pearl varieties (5.32) of guinea fowl and their crosses as well (5.22) at 14<sup>th</sup> weeks of age. Khairunnesa et al., (2016) found the FCR values of 3.55, 2.88, 3.00, 4.10 at 5<sup>th</sup>, 10<sup>th</sup>, 15<sup>th</sup>, 20<sup>th</sup> weeks, respectively in guinea fowls reared under intensive rearing. The differences in FCR values between present and previous results could be due to age of birds, nutrients concentration in diets, management regime and also environmental factors. Among these factors, Mwale et al., (2008) however categorically mentioned 'age' as the most influential that directly related with FCR, because the guinea fowl

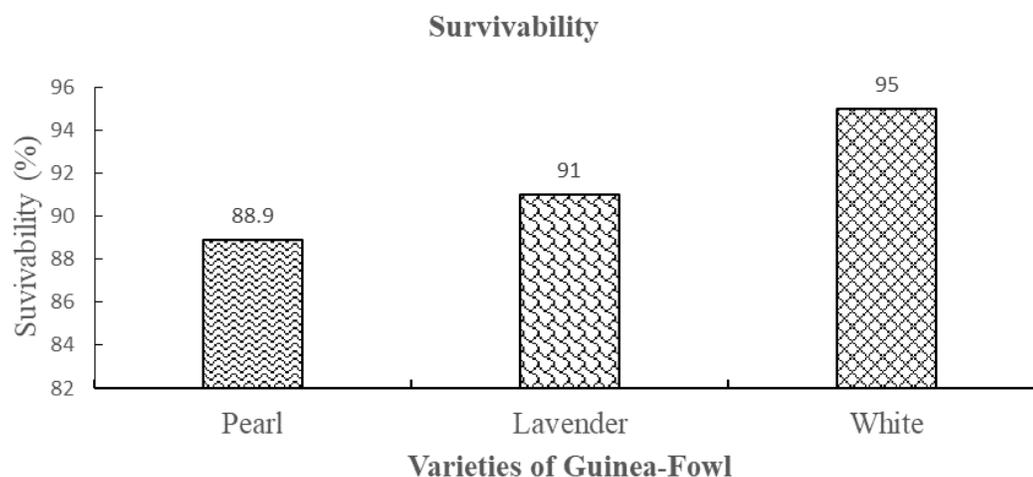
requires higher amount of feed for the body maintenance, which is related to their age.

#### Bird's survivability

The survivability of three types of guinea fowl under intensive system is shown in Figure 2. Although the data were not statistically significant, the survivability of White variety was numerically higher (95%) than that of Lavender (91%) and Pearl (88.9%). In general, poor susceptibility of the keets to adverse weather conditions and disease outbreaks at brooding, poor mothering by the guinea fowl hens and relatively weaker keets at hatching led to high keet's mortality (Embury, 2001). In present study, a total of 135 birds were considered for experimentation, of which 11 had died during the whole study period. Among these, five birds from Pearl, four from Lavender and two birds were died from White color, and the overall average mortality was 8.15%. In recent observation, Zeleke et al., (2020) mentioned about 6.7% overall mortality of layer type guinea fowl at 29<sup>th</sup> weeks of rearing. Relatively lower mortality (2.3%) at 18<sup>th</sup> weeks of age was also recorded by Yamak et al., (2018). Published reports however suggest that the good managerial practices in brooding might reduce keet's mortality as low as 3 to 5% (Galor, 1983). Thus, the survivability of guinea fowls recorded in present study was quite resemble to the several reports published earlier.



**Figure 1.** Changes in cumulative FCR at five-week interval of the Pearl, Lavender and White varieties of guinea fowl. <sup>a,b,c</sup>means with different superscripts within the same row differ significantly.



**Figure 2.** Survivability of Pearl, Lavender and White variety of guinea fowl under intensive system

### Conclusion

Taken all together, it may be concluded that the Lavender variety of guinea fowl showed comparatively better growth performances as compared to Pearl and White under full confinement in local weather condition of Bangladesh. Therefore, the Lavender variety can be recommended for small and medium scale farming for better performance.

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### Author Contribution

S.C.D: Design, formulation and supervision of experiment. F.S.: Performing the field and lab experiments, collection of data and writing of manuscript. B.D.: Supervision of experiments and review the manuscript. A.A: Analyses of data. T.A.: Writing of manuscript. A.L.: Writing of manuscript.

### Competing interests

The authors have declared that no competing interests exist

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