

## IMPACT OF SEASONAL VARIATION ON EGG PRODUCTION AND MORTALITY IN FAYOUMI, ALBALADY, AND BLACK AUSTRALORP BREEDS

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### Abstract

Climate change presents a high level of vulnerability to Pakistan among globally. Both catastrophic floods and droughts occurred in Pakistan throughout the recent decades. Climate change has severe negative effects upon Pakistan's agricultural production sector. Performances of poultry in tropical environments are significantly influenced by the main non-genetic factor which is seasonal variation. Research was conducted to analyze how climatic season fluctuations affected the population size as well as mortality rates among Fayoumi, Albalady and Black Australorp dual-purpose chickens in the semi-intensive system of Islamabad Pakistan. 300 laying hens (100 each breed) were studied for 12 months from winter through spring and summer until autumn. Research data about weekly egg numbers together with mortality statistics along with temperature-humidity index (THI) measurements. The summer season resulted in a major decrease of egg production alongside higher mortality rates across all breeds but Black Australorp faced the most severe impact. The Fayoumi breed maintained reliable reproduction rates and showed the lowest death rates at all times which confirms its successful seasonal adaptation. Albalady showed an average behavior pattern of resilience yet its production and peak summer performance declined substantially. The research data highlights the necessity of choosing suitable poultry breeds as well as implementing adaptive management for reducing seasonal stress during farming operations.

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## INTRODUCTION

Poultry produces more animal protein than any other domesticated animal worldwide and totals 30% of food protein according to FAO (2000) statistics. Poultry farming in Pakistan benefits society by providing food protection while boosting nutrition levels and regional economies according to Permin and Pedersen (2000). People use Fayoumi, Albalady, and Black Australorp breeds equally for producing both meat and eggs in poultry farming practices. Such breeds work well in both professional and personal farms thanks to their environmental tolerance and lower needs (Rehman et al. 2018; Iqbal et al. 2021). Although poultry breeds are flexible by nature they suffer from environmental challenges especially when temperature swings become severe. Changes between hot summer and cold winter seasons strongly affect how well Pakistani poultry handles both biological functions and medical wellness. During hot summers high air temperatures create heat stress for poultry which cuts their food intake reduces egg production weakens their immune system and raises death rates (Khan et al. 2022; Nawab et al. 2018). Evidence shows that winter cold temperatures negatively impact the behaviors and egg-producing ability of poultry according to Akinokun et al. (2019). Fayoumis originated from Egypt where people use them in South Asia to manage extreme weather because this bird breed handles temperature better than other birds (Farooq et al., 2000). The Black Australorp breed produces many eggs with good weight yet needs controlled climate management when temperatures get extreme per Rashid et al. (2020). Albalady has an average egg production rate that changes unpredictably between seasons making it ready for productive enhancement through careful breeding and better chicken care practices (Younas et al., 2023). Research takes place on the National Agricultural

Research Centre (NARC) fields to see how egg production by hens changes throughout the year across three different breeds. The semi-arid weather of Islamabad with extreme summer temperatures and cold winter lows makes it an excellent place to examine heat and cold weather impacts on poultry. The research tracks poultry feeding habits, egg production results and death rates through all seasons to develop precise recommendations for raising chickens in different climates. This data helps farmers and professionals enhance their selection of chicken breeds plus their ventilation systems while keeping temperature management schedules to support uninterrupted egg production. The connection between different chicken breeds and environmental changes needs exact study because South Asia expects many more intense heatwaves due to global warming according to IPCC's 2021 report. The specific adaptations for poultry breeds possess heat-resistant housing types with better ventilation plus electrolytes and seasonal vaccines ease production and protect animal welfare status (Ali et al., 2020; Rehman et al., 2022).

## MATERIALS AND METHODS

A total of 300 hens (100 per breed) aged 22 weeks were housed in semi-intensive systems at the National Agricultural Research Centre (NARC), Islamabad. The study spanned 12 months (January–December), covering all four seasons. Birds were given a standard layer diet and monitored weekly for egg production and mortality.

Temperature and humidity were recorded daily to compute the Temperature-Humidity Index (THI) per season. Data were statistically analyzed using one-way ANOVA, and breed-by-season interactions were examined.

## RESULTS

Black Australorp produced the most eggs in spring and autumn but dropped significantly during summer due to heat sensitivity. Fayoumi remained

stable across all seasons. Albalady's performance was moderately impacted by summer (Fig. 1).

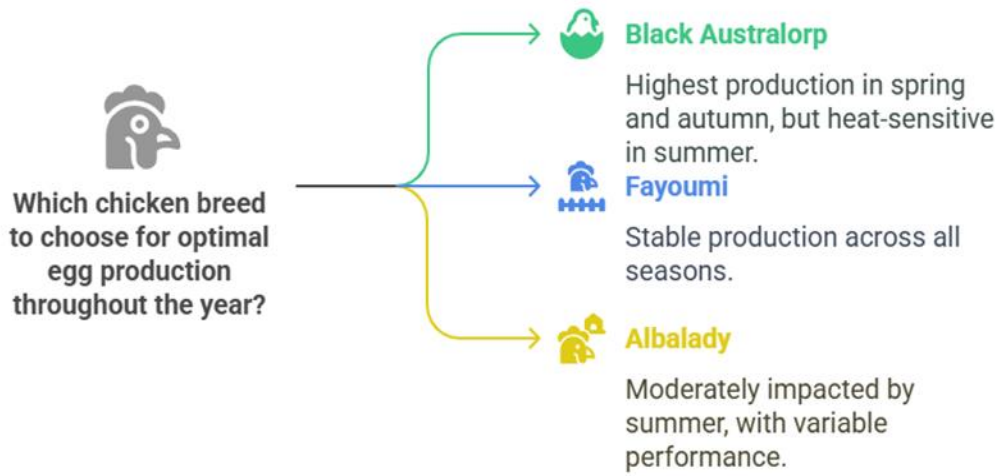


Fig. 1

Table 1: Average Egg Production per Bird per Season (Eggs/Season)

Breed	Winter	Spring	Summer	Autumn
Fayoumi	54	60	50	58
Albalady	48	55	42	51
Black Australorp	62	70	38	66

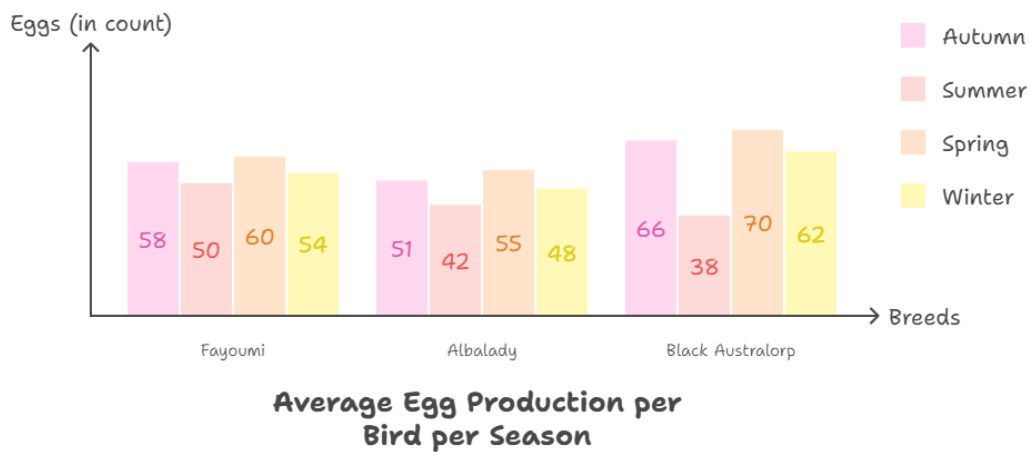


Fig. 2

Summer showed the highest mortality rates, especially in Black Australorp (10%), likely due to poor heat tolerance. Fayoumi had the

lowest mortality across seasons, indicating strong adaptability.

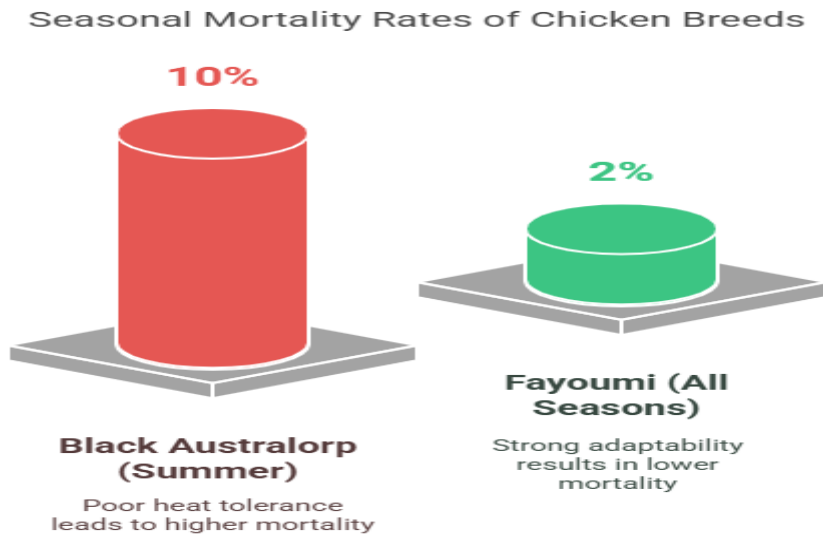


Fig. 3. Seasonal mortality of breed

Table 2: Mortality Rate (%) per Season

Breed	Winter	Spring	Summer	Autumn
Fayoumi	2%	1%	4%	2%
Albalady	3%	2%	7%	3%
Black Australorp	4%	2%	10%	4%

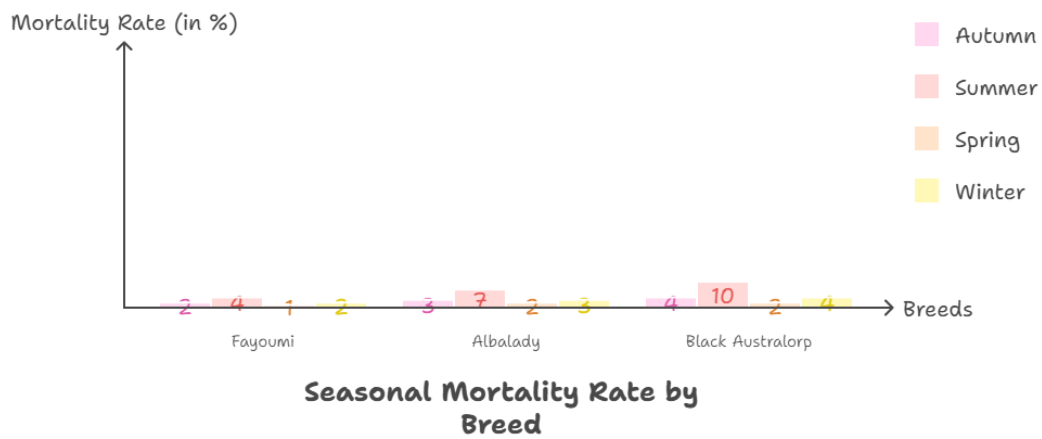


Fig. 4

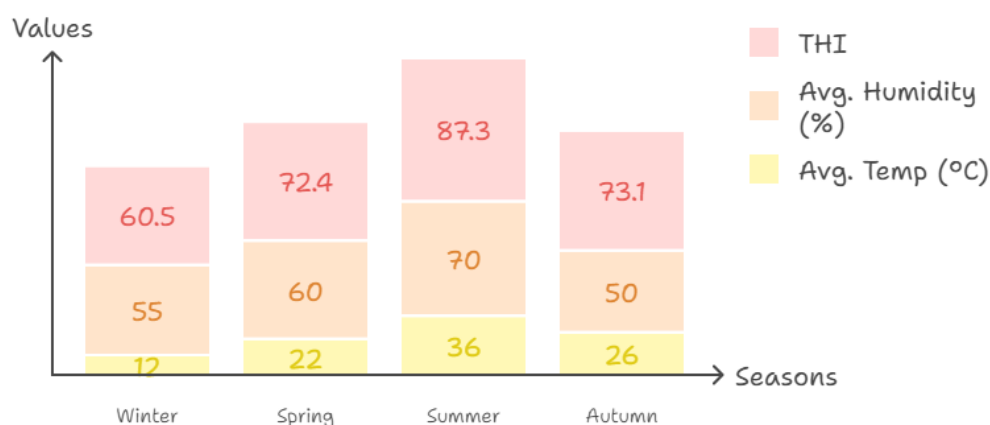
Summer had the highest THI, correlating with increased mortality and reduced laying. Lower

THI in winter and spring corresponded with better productivity and survivability.

Table 3: Seasonal Temperature-Humidity Index (THI)

Season	Avg. Temp (°C)	Avg. Humidity (%)	THI
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Winter	12	55	60.5
Spring	22	60	72.4
Summer	36	70	87.3
Autumn	26	50	73.1



**Seasonal Temperature-Humidity Index (THI) by Season**

## DISCUSSION

The research indicates that seasonal changes strongly affect productivity along with survivability outcomes in laying hens. The thermoneutral zone of poultry gets exceeded by combination of high temperatures and humidity levels that manifest through the Temperature-Humidity Index (THI) leading to heat stress. Heat-stress implications diminish feed consumption and disrupt digestive performance so both egg production dips and death rates escalate (Nawab et al., 2018). Fayoumi hens showed exceptional survival ability during every season that the researchers observed. The fertility rate and survival numbers remain high throughout summer and winter because Fayoumi chickens survived to stay in hot environments paired with disease-resistance qualities (Iqbal et al., 2021). These birds maintain high success rates in low-input farming systems because they have small body size and effective metabolism

regulation. Various research studies confirm that indigenous breeds prove best suited for adapting to adverse climatic situations (Melesse, 2014). The Black Australorp breed produced good results for egg quantity in spring and autumn then showed decreased egg numbers and higher death rates during summer peak. Research has shown that this breed faces higher risk of being stressed by heat because its combination of large size together with elevated metabolic heat production (Akinokun et al., 2019). Breed-specific thermal management strategies should have priority implementation at commercial facilities that utilize exotic breeds according to Sohail et al. (2012). The dual-purpose breed Albalady displayed performance values between the other two breeds which suggests it has both exotic and indigenous ancestry yet its stress reaction to seasonal conditions is only partial. The mortality level confirms the need to pursue

selective breeding and improved housing and nutrition programs because these interventions could boost the breed's results. Directed genetic and environmental changes are necessary for moderately successful breeds according to Kitalyi (1998). All three breeds must implement adaptive management programs because they experience similar seasonal pressures. Proper climate stress management includes recommendations to install ventilation systems alongside clean water provision and dietary alignments which will benefit both flock welfare and productivity (Rashid et al., 2020). Improve summer thermal comfort for animals by feeding them tolerant feed and implementing housing with natural ventilation and shading structures (Habibu et al., 2021). An implementation of local indigenous knowledge systems to manage diseases and reduce stress will optimize the sustainability of target breeds (Permin & Pedersen, 2000). The yearly maximum productivity level requires breed-specific approaches as a necessary foundation. Black Australorp stands as the best choice for moderate climates because of high production rates yet Fayoumi demonstrates best resistance to various environmental stressors and Albalady holds potential through management improvements. The conclusions from this research enable authorities to select suitable poultry breeds while building climate-resistant farming systems in Pakistan and comparable regions.

## CONCLUSION

Changes in seasons including intense summer heat produces negative consequences on the productivity levels and survival possibilities of Pakistani native poultry breeds. Summer

heat stresses poultry animals to limit their food intake and reduces their egg output yet it raises their mortality numbers in the population. The Fayoumi breed efficiently resisted environmental changes because it maintained steady production numbers alongside minimal death rates throughout the entire year. The breed presents an optimum choice for userModel backyard farms together with minimal-input operations because it carries adapted genetics for heat tolerance. Under perfect environmental conditions Black Australorps showed their superiority through their highest egg production numbers together with extended dimensions of individual eggs. Remarkable heat exposure diminished the work capacity of Black Australorp because this breed turned out to be sensitive to high temperatures leading to increased need for constant care during hot weather. The Albalady breed shows intermediate results between Black Australorp and White Leghorn in egg output and survival rates thus proper breeding strategies could enhance its capacity to withstand worsening climates. Policymakers alongside poultry researchers and breeding farmers can use the gathered research data to make educated choices regarding their choice of breeds as well as their management operations. Climate change continues to intensify its effects on the environment therefore development of poultry farming systems that withstand changing climates becomes essential. To ensure sustainable egg production along with animal welfare protection in every season breed-specific strategies need improved housing structures, climate-controlled feed distribution systems and stress reduction regulations. The rural poultry sector in Pakistan can achieve

better economic stability coupled with food security by adapting to changing climatic conditions.

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