Research Article

Evaluation of the Effectiveness of Hepaflush and Onion Juice on the Production Performance of Broiler Chickens under High-Temperature

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Abstract | The present study aimed to evaluate the effect of dietary supplementation with Hepaflush and onion juice on the productive performance of broiler chickens under heat stress. A total of 150 one-day-old broiler chicks were reared and randomly allocated into three experimental treatments, with 50 chicks per treatment. Each treatment was further subdivided into five replicates of 10 chicks each, following a completely randomized design (CRD) to ensure experimental accuracy and minimize error. The chicks were assigned to the treatments during the first week of age. The first treatment (T1) served as the control group. In the second treatment (T2), Hepaflush solution was added to the drinking water at a concentration of 1 mL/L, along with onion juice at 1 mL/L. Additionally, the ambient temperature was increased by 6 ˚C above the control for 4 hours daily to induce heat stress. The third treatment (T3) was exposed to the same elevated temperature (6 ˚C above control for 4 hours daily) but did not receive any dietary supplementation. The results showed significant differences among treatments. Birds in the second treatment (T2) exhibited significantly higher body weight ($p < 0.01$) compared with those in T1 and T3. Moreover, T2 significantly outperformed both T1 and T3 ($p < 0.01$) in terms of body weight, chest circumference, livability (survival rate), and recovery rate. The study concluded thta supplementation with Hepaflush and onion juice improved growth performance and survivability of broiler chickens under heat stress. This combination may help reduce the negative effects of high temperature in broiler production.

Keywords | Broiler chicken, Heat stress, Hepaflush, Onion juice, Recovery rate

Received | January 21, 2026; **Accepted** | February 17, 2026; **Published** | April 30, 2026
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Citation | Ali AS, Nasser SA (2026). Evaluation of the effectiveness of hepaflush and onion juice on the production performance of broiler chickens under high-temperature. J. Anim. Health Prod. 14(2): 713-718.
DOI | https://dx.doi.org/10.17582/journal.jahp/2026/14.2.713.719
ISSN (Online) | 2308-2801

INTRODUCTION

Providing sufficient protein to meet human nutritional requirements is considered one of the major challenges facing the world in the twenty-first century. Many countries, particularly developing countries, suffer from severe food shortages due to several factors, including rapid population growth and the decline in food resources as a result of climate change (Al-Jebory *et al.*, 2024). To ensure food security and meet the growing demand for animal products, the search for low-cost and easily accessible sources of animal protein has become both vital and urgent (Irawan *et al.*, 2022; Al-Jebory and Naji, 2023; Arkan *et al.*, 2025). In recent years, the poultry industry has experienced remarkable global development, supported by the adoption of advanced technologies and innovative equipment, which have contributed to the progress of the agricultural sector in both plant and animal production to meet human nutritional needs. Growth rate, growth efficiency, and feed conversion efficiency are among the most critical factors determining poultry production performance. However, achieving optimal productive performance depends on

several interrelated factors, including biological conditions, dietary composition, and the genetic characteristics of chickens. In addition, intestinal health has recently received considerable attention as a key factor influencing productivity and overall performance in poultry production systems (Rubio, 2024; Salman *et al*., 2025).

Feed additives play an essential role in enhancing the ability of birds to utilize dietary nutrients, leading to improved productivity through better feed conversion efficiency (Taher *et al*., 2024; Alsudani *et al*., 2025). Numerous attempts have been made to improve the productive performance of poultry through the use of natural feed additives and nutritional supplements. Among these additives are onion extracts and functional supplements that support vital organs, such as Hepaflush.

Hepaflush is a nutritional supplement known for its supportive role in liver function, as it contains several active compounds that enhance metabolic processes, promote detoxification, and improve the efficiency of nutrient metabolism in birds. This supplement contributes to maintaining overall health status in poultry, particularly under environmental stress conditions such as heat stress, by reducing oxidative stress and improving physiological responses. Improved liver function positively reflects on nutrient utilization, growth performance, and feed conversion efficiency, making Hepaflush a promising dietary additive for enhancing productivity and welfare of broiler chickens, especially in hot environments (Malematja *et al*., 2021). In recent years, interest has increased in the use of onions and other medicinal plants in poultry nutrition as natural alternatives to antibiotics that were previously widely used but later restricted due to their adverse long-term effects. These natural extracts and supplements have been shown to enhance growth performance, productive efficiency, nutrient digestibility, and overall health status in poultry (Borgohain *et al*., 2017; Kadhim *et al*., 2025).

Temperature and humidity are among the most critical climatic factors affecting broiler meat production, particularly in open housing systems, which constitute the majority of poultry farms in the southern governorates. When ambient temperatures exceed the optimal thermal comfort zone for birds, broilers are subjected to heat stress. Clinical signs of heat stress include panting, increased respiratory rate, and wing spreading away from the body as birds attempt to dissipate excess body heat. Heat stress negatively affects feed intake, increases water consumption, reduces meat quality, and suppresses immune function. These physiological alterations ultimately reduce meat yield and increase susceptibility to diseases (Ali and Abdulkareem, 2023).

The present study aimed to evaluate the effect of dietary supplementation with Hepaflush and onion juice on the productive performance of broiler chickens and to determine whether these additives can serve as natural and effective strategies to mitigate the adverse effects of heat stress, thereby improving productivity and enhancing bird welfare under hot environmental conditions.

MATERIALS AND METHODS

Animals and experimental design

A total of 150 broiler chickens were reared at the Animal Production Farm, College of Agriculture, University of Dhi Qar. All experimental protocols were conducted in accordance with international standards and were approved by the Institutional Ethics Committee. Several days before the arrival of the chicks, the house was thoroughly cleaned and disinfected using disinfectants and formalin, and the corners of the house were sprayed with insecticides. After completing the cleaning process, the house (barn) was equipped with the necessary facilities for bird rearing, including feeders, drinkers, and ventilation openings, Gas brooders, electric heaters, and an electronic thermometer were used to monitor and control the temperature of each treatment separately. A few hours before the birds were placed in the house, wood shavings at a depth of 5 cm were spread on the floor, the brooders and thermometer were turned on, and feeders and drinkers were filled with water. Sugar was added to the drinking water at a rate of 5% to receive the chicks and reduce transport-related stress.

Grouping and treatments

After arrival, 150 one-day-old broiler chicks were randomly allocated to three experimental treatments, with 50 chicks per treatment. Each treatment was further subdivided into five replicates, with 10 chicks per replicate, following a completely randomized design (CRD) to ensure experimental accuracy and minimize experimental error. The chicks were distributed to the treatments during the first week of age. Birds in each treatment were identified by plastic leg bands for identification and follow-up. The field experiment lasted for 35 days. The first treatment (T1) served as the control group in which the ambient temperature was maintained at the normal level and no dietary supplements were provided. In the second treatment (T2), Hepaflush solution was added to the drinking water at a concentration of 1 mL/L whose main component is a sorbitol solution, along with onion juice at 1 mL/L. Additionally, the ambient temperature was increased by 6 °C above the control for 4 hours daily to induce heat stress. The third treatment (T3) was exposed to the same elevated temperature (6 °C above control for 4 hours daily) but did not receive any dietary supplementation (Ali and Abdulkareem, 2023). The relative humidity

within the poultry house ranged from 55% to 60% and was maintained without increase during the period of heat stress exposure. The feed used in the experiment was formulated according to specified proportions of feed ingredients, and its chemical composition was calculated accordingly (Table 1).

Table 1: The chemical composition of the feed material used in the basal diet.

Feed material (%)	Starter feed (1-11 day)	Growth feed (12-25 day)	Finishing feed (26-35 day)
Yellow corn	31	28	28
Wheat	25	36	34
Soybean meal*	35	27	29
Premix**	2.5	2.5	2.5
Vegetable oil	3	3	3
Limestone	2.70	2.70	2.70
Table salt	0.25	0.25	0.25
Lysine	0.03	0.03	0.03
Methionine	0.03	0.03	0.03
Vitamin mixture	0.44	0.44	0.44
Antidote (Prastracin)	0.05	0.05	0.05
Total	100	100	100
Calculated chemical composition			
Total energy (kcal/kg)	3120	2970	2996
Protein (%)	21.94	18.92	22.7
Fiber (%)	3.88	3.66	3.58
Calcium (%)	1.04	0.20	1.07
Phosphorus (%)	0.20	0.20	1.28
Sodium (%)	0.68	0.62	0.60
Lysine (%)	1.12	0.98	0.94
Methionine (%)	0.34	0.30	0.30

* Soybean meal was sourced from Argentina and contains 48% protein and 2230 kcal/kg. The feed was provided to the birds in the form of pellets, which were produced by the private company Jaw Harat Babel, following the chemical composition of feed ingredients as reported by the National Research Council (1994, NRC). ** The premix contained dicalcium phosphate, a blend of vitamins, a blend of minerals, an antioxidant, and an anticaking agent. It was prepared by BASF, Germany.

Study parameters

At the end of each week, live body weights of all birds subjected to the experimental treatments were measured according to the methods described by Al-Fayyad *et al.* (2011) and Al-Saeedi *et al.* (2023). Chest circumference was also measured following the procedure reported by Ajafar *et al.* (2024). At the end of the experiment, the average body weight was calculated using the equation described by Khaleel (2021, 2025). In addition, net body weight, chest circumference, dressing percentage, and recovery (healing) rate were calculated according to Ali and Abdulkareem (2023).

$$\text{Dressing \%} \frac{carcass\ weight}{live\ chicken\ weight} \times 100$$

$$Recovery\ (healing)\ \% \frac{Meat\ Weight}{Carcass\ Weight} \times\ 100$$

Statistical analysis

Statistical analysis of the data in this study was performed using the General Linear Model (GLM) in the statistical program SAS (2018), where the effect of the treatments on the studied traits was determined using the Complete Randomized Design (CRD). To determine the significance of the differences between the studied means, Duncan's multiple range test (Duncan, 1955) was used at the $p < 0.05$ and $p < 0.01$ levels, according to the following model:

$$Yijk = M + ti + eijk$$

Where; Yijk, Viewing value attributable to transaction; M, Overall average value; ti: Transaction value; eijk: The value of the random error that is normally distributed.

RESULTS AND DISCUSSION

Table 2 shows the effect of the experimental treatments on the average weekly live body weight of broiler chickens. Birds in the second treatment (T2) exhibited a significant increase in body weight ($p < 0.01$) from the first week until the end of the experiment at 35 days of age. This increase may be attributed to the dietary supplementation with Hepaflush, which acts as an appetite stimulant by enhancing liver function, thereby increasing feed consumption. Greater feed intake provides essential nutrients, such as proteins and amino acids, which directly contribute to body weight gain. Additionally, onion juice has effects similar to antibiotics, promoting activity and feed utilization. The combined action of Hepaflush and onion juice likely explains the improved live body weight observed throughout the rearing period.

These findings are consistent with those of Lee *et al.* (2016), who reported that nutritional supplements in broiler diets improve production performance, increase body weight, and enhance feed conversion efficiency. Supplements also help reduce the thermal burden on birds, maintaining meat productivity and quality under heat stress conditions, which aligns with the observations in the present study. Similarly, Olanrewaju *et al.* (2025) noted that onions contain organic sulfur compounds, such as disulfides, which have biological activity that promotes growth. Their study highlighted the positive effects of onion supplementation in poultry, including increased body weight, improved feed conversion efficiency, reduced mortality, and enhanced immunity.

Table 2: The effect of adding Hepaflush and onion juice on the weekly body weight of broilers (g ± SE).

Treatments	1st week	2nd week	3rd week	4th week	5th week
T1	209.00 ±3.53[a]	598.40±12.95[a]	1210.90±36.02[a]	1788.70±50.34[b]	2239.70± 38.85[b]
T2	215.50±4.85[a]	603.30±14.51[a]	1290.30±39.87[a]	1900.80±45.84[a]	2813.90± 37.71[a]
T3	195.80±1.99[b]	430.30±14.42[b]	1096.60±21.56[b]	1447.00±29.21[c]	1940.00 ± 14.69[c]
Significance level	**	**	**	**	**

Means with different letters within a column are significantly different from each other. ** ($p \leq 0.01$).

Table 3: The effect of adding Hepaflush and onion juice on the weekly chest circumference of broilers (cm ± SE).

Treatments	1st week	2nd week	3rd week	4th week	5th week
T1	4.50 ± 0.17[b]	7.70 ± 0.36[b]	10.50 ± 0.39[b]	12.70 ± 0.42[b]	14.60 ± 0.27[b]
T2	6.00 ± 0.07[a]	9.20± 0.11[a]	12.10 ± 0.23[a]	14.75 ± 0.13[a]	17.00 ± 0.21[a]
T3	4.30 ± 0.15[b]	6.70 ± 0.26[c]	8.80 ± 0.29[c]	11.00 ± 0.21[c]	12.90 ± 0.23[c]
Significance level	**	**	**	**	**

Means with different letters within a column are significantly different from each other. ** ($p \leq 0.01$).

The findings of the present study are also consistent with Alani and Al-Mashhdani (2023), who reported that the significant increase in body weight of chicks fed diets containing onions is due to the chemical composition of onions, which are rich in the amino acid methionine and essential minerals. This composition helps achieve nutritional balance within the bird's body, allowing optimal utilization of feed components and positively affecting growth and weight gain. Moreover, Alagawany *et al.* (2021) and Chaturwedi *et al.* (2021) noted that onions contain various organic compounds, flavonoids, and phenolic acids with proven antibacterial, antifungal, antioxidant, and hypolipidemic properties, all of which contribute to enhanced poultry growth. However, the results of the present study do not align with those of (Karangiya *et al.*, 2016).

In contrast, birds in the third treatment (T3) recorded the lowest live body weight compared to the first (control) and second treatments. This reduction is likely due to exposure to heat stress, which is known to decrease feed intake and suppress appetite in poultry. Meanwhile, the first treatment (T1, control) recorded body weights close to standard reference values.

Table 3 presents the average breast circumference of broiler chickens during the rearing period (from day one to the fifth week). Birds in the second treatment (T2) showed a consistent increase ($p < 0.01$) in breast circumference across all weeks, despite exposure to heat stress. This improvement may be attributed to the supplementation of Hepaflush, which contains L-carnitine. As a key amino acid derivative, carnitine enhances energy utilization by facilitating the transport of long-chain fatty acids into mitochondria for ATP production. Improved energy efficiency supports thermotolerance in birds under heat stress and contributes to growth in the pectoral region, resulting in increased breast circumference. These observations are consistent with Malematja *et al.* (2023), who highlighted the role of energy in mitigating heat stress through nutritional supplementation.

The addition of onion juice further enhanced the birds' immunity. The combination of increased appetite and improved bio-immunity contributed to the expansion of the breast musculature. Hepaflush also supports liver function, promoting protein and lipid metabolism, improving nutrient utilization, stimulating appetite, and enhancing feed conversion ratio (FCR), all of which positively impact growth, particularly in the breast region. Furthermore, the antioxidant properties of Hepaflush help reduce physiological stress, creating a favorable internal environment for muscle accretion. These results align with Ali and Abdulkareem (2023) and Al-Ramamneh (2018), who reported that onion juice and similar nutritional interventions improve productive performance and muscle development in chickens.

In contrast, Treatment 3 (T3) recorded the lowest weight rates for breast circumference. This significant ($p < 0.05$) decrease is attributed to the adverse effects of stress. Physiologically, stress stimulates the Hypothalamic-Pituitary-Adrenal (HPA) axis, resulting in elevated corticosterone secretion. This hormone acts as a catabolic agent, stimulating the proteolysis of muscle tissues particularly in the breast to provide carbon skeletons for gluconeogenesis to meet the increased energy demands under stress. Moreover, stress leads to an energy imbalance, where absorbed nutrients are partitioned toward vital defensive functions instead of anabolism, negatively impacting muscle fiber development. This result supports the hypothesis that stress reduces feed conversion efficiency, thereby limiting standard growth parameters in the affected treatments and (Al-Obaidi and Hassan, 2024).

Table 4 illustrates the effect of the experimental treatments on dressing percentage and recovery rate (deboning yield). Birds in the second treatment (T2) showed a significant increase ($p < 0.01$) in both dressing and recovery percentages by the fifth week. This improvement is attributed to enhanced feed conversion efficiency resulting from supplementation with Hepaflush and onion juice, which positively influence appetite and immunity. The combined effects of appetite stimulation and improved bio-immunity contributed to higher productivity. Additionally, onion juice enhances intestinal capacity for amino acid absorption, even under elevated temperatures.

Table 4: Effect of hepaflush and onion juice on dressing (clearance) and recovery (deboning yield) rates of broilers.

Treatment	Clearance ratio (%)	Recovery rate (%)
T1	75.60±1.35[b]	65.50±0.22[b]
T2	81.70±0.74[a]	68.70±0.39[a]
T3	70.40±1.45[c]	64.40±0.16[c]
Significance level	**	**

Means with different letters within a column are significantly different from each other.** ($p \leq 0.01$).

These results are consistent with Omar *et al.* (2020) and Al-Jebory and Ibrahim (2021), who reported that onions contain bioactive compounds such as polyphenols, terpenoids, phenols, lectins, alkaloids, and essential oils that stimulate digestion and improve growth and productive performance in poultry. Onions also promote bile acid synthesis and increase the activity of pancreatic enzymes, particularly lipase and amylase, leading to improved lipid digestion.

In contrast, birds in the third treatment (T3), exposed to heat stress without supplementation, exhibited reduced dressing and recovery percentages. Heat stress is known to impair these ratios due to muscle protein catabolism mediated by adrenocorticotropic hormone (ACTH), resulting in decreased carcass weight and lower meat yield. The reduction in dressing and recovery percentages under heat stress aligns with findings by Nasser and Al-Shuaibi (2023), Al-Salhie and Al-Hummod (2025), and Al-Saeedi *et al.* (2023), highlighting the negative impact of high temperatures on carcass quality.

CONCLUSION

The present study concluded that supplementation with Hepaflush and onion juice positively influenced the final body weight and overall productive performance of broiler chickens over the 35-day rearing period. Despite exposure to elevated temperatures, the birds' feed intake was not adversely affected. No antibiotics were used in the second treatment, indicating that onion juice may serve as a natural alternative to antibiotics by enhancing immunity and promoting growth.

These findings highlight the potential of Hepaflush and onion juice as natural feed additives to mitigate the negative effects of heat stress in poultry. The study recommends future experiments to evaluate the individual effects of Hepaflush and onion juice, in addition to their combined application, to determine whether observed improvements result from synergistic or independent actions. Such research will provide valuable insights for poultry breeders and feed manufacturers in developing effective, natural nutritional strategies while reducing reliance on antibiotics.

ACKNOWLEDGEMENTS

I would like to express my sincere gratitude and appreciation to the Collage of Agriculture at Dhi-Qar University for their contribution and assistance in completing this research.

NOVELTY STATEMENT

This is the first study to use Hepaflush and Onion Juice in treating heat stress in poultry.

AUTHOR'S CONTRIBUTION

The authors, Abeer S. Ali and SAkAin AidAn nASSer, worked together on all aspects of the experiment, including farm and laboratory work, data collection and analysis, and manuscript writing.

Funding statement

The research was self-funded by the researchers.

Conflict of interest

The author have declared no conflict of interest.

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