Comparative study for the effects of locally prepared premix and other imported premixes in broilers carcasses characteristics

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Abstract. The study was conducted in the Poultry Farm in the Technical College AL-Mussayab during the period that began at the 1st of November 2016 till the 5th of December 2016, to investigate the effect of substitution imported by local premixes on carcass traits of broiler. A total of 540 one day old broiler chicks (Ross 308) were used, chicks were randomly distributed into 9 treatments, with 2 replicates per treatment (30 chick / replicate). Chicks fed on the experimental rations by supplementation 25 Kg Premix / ton feed, treatments were as follows; T1 control (contained a local premix), T2, T3 and T4 were contained Wafi, Provimi and Max Care premixes respectively. Moreover T5, T6 and T7 were contained a local premix with Wafi or Provimi or Max Care at rate 50: 50 respectively, T8 contained imported premixes (Wafi, Provimi and Max Care at a rate 1/3 for each), T9 contained all studied premixes, local and imported at rate ¼ for each one, to cover the requirements of birds according to the age period. Results revealed significant differences between treatments in dressing percent to T6. Meanwhile treatments did not differ between them in the relative weight of the main and secondary carcass cuts except for the relative weight of the drum stick where the surpassing was recorded for T7 on other treatments.

1. Introduction
The prepared mixture that called premixes they are mix some minerals, vitamins and Essential amino acids that have added to the ration to meet the necessary needs for breeding poultry Which basic food that the ration consist of were not able to provide according to the requirements, to cover the best production, as well as the body of the poultry cannot form it [1].
It is important things the process of inserting the mixtures (premixes) in the ration for the poultry and all breeding stages according to the poultry needs[ 2].

The premixes consist from two main parts, Active material and carrier, there are many types uses as carrier there are different among them in many characteristics but all of them perform the same purpose which is increasing the Surface area and the Intensity of the mixture. The carrier can be organic providing the poultry some nutrition elements[ 3]and it can be non-organic materials like Limestone silica and others dependent on physical and chemical capability for achieving the homogeneity between the exact ingredients of the mixture[ 4]. The main aim of this study shows the
effect of the local premix and some exporting premixes in the Caracas characteristics of Rose 308 for saving Hard currency and operate the local factories and improving the readiness of mixture and increasing the active age without any Road transport and shipping obstacles In the midst of security conditions in our country.

2. Materials and methods
The study was carried out in the poultry farm – Technical college Al- musaiyib / ALforat AL-awsat university during the period 1/11/2016 until 5/12/2016 – to breeding chickens, Rose 308 by using 540 one day broilers randomly distributed on nine experimental treatments for every treatment 60 chicks divided into two replicates every 30 checks for every one replicate as follow :T1 (first treatment ) = the local premix that produce from collective and mix Babylon Ghadeer fodder factory laboratory (the ton price 1150 $), T2 (second treatment ) = exported premix from Holland AL-Wafi company (the ton price 1350 $), T3 (third treatment )= premix exported from American Provimi company (the ton price 1800 $), T4 (fourth treatment )= premix exported from Holland company Max Care (the ton price 1600 $), and the T5 and T7 they about a combinations from the local mixture with exported mixtures 50:50, T8 it use in it the exported mixtures by One third while the last T9 used in it all the fourth mixtures (table 1).

Prepared the locally premix by Babylon Ghadeer fodder factory laboratory by using a sufficient electric program (Best Mix) to conduct that calculation from American Cargill company virgin April 2016 (table 2).

| Table 1 | compassion between the nutrients for each type of premixes involved in the rations. |
|---------|------------------------------------------|
| description | units | local | Wafi | Provimi | MaxCare |
| ME kcal | 2007 | 0 | 4100 | 1540 |
| CP % | 22.23 | 0 | 17 | 11.2 |
| FAT % | 1.5 | 0 | 1.1 | 0 |
| Ca % | 17.13 | 23.2 | 16.55 | 19.8 |
| lysine % | 4.27 | 1.6 | 10 | 5.4 |
| AV. P % | 1.24 | 0.93 | 1.31 | 1.04 |
| Na % | 3.4 | 4.9 | 4.8 | 6.4 |
| CL % | 5.23 | 0 | 5.8 | 0 |
| methionine % | 6.04 | 6 | 8.55 | 8.5 |
| Meth + cyst. % | 6.13 | 6 | 8.55 | 9 |
| threonine % | 0.918 | 0 | 0.55 | 0.5 |
| VIT. A IU/kg | 200000 | 440000 | 575000 | 480000 |
| VIT. D3 IU/kg | 40000 | 120000 | 201250 | 140000 |
| VIT. E mg/kg | 4000 | 1200 | 1380 | 2000 |
| VIT. K mg/kg | 200 | 100 | 138 | 120 |
| VIT. B1 (thiamin) mg/kg | 494 | 120 | 138 | 160 |
| VIT. B2 (riboflavin) mg/kg | 800 | 280 | 345 | 300 |
| VIT. B3 (niacin) mg/kg | 4000 | 1600 | 1840 | 2000 |
| VIT. B5 (pantothenic acid) mg/kg | 1304 | 640 | 552 | 600 |
| VIT. B6 (pyridoxin) mg/kg | 400 | 160 | 184 | 200 |
| VIT. B9 (folic acid) mg/kg | 200 | 40 | 46 | 40 |
| VIT. B12 (cyanocobalamin) mcg/kg | 800 | 1400 | 1000 | 1000 |
### Table 2. Added rate of ingredients that included in local premix *

| No. | Item                          | Added rate | s                      |
|-----|-------------------------------|------------|------------------------|
| 1   | Soya bean meal                | 33.9       | Importer argentine origin by eagle company (48%) protein |
| 2   | limestone                     | 20.5       | Iraqi source           |
| 3   | Mono calcium phosphate        | 5          | MCP Turkish source HI-PHOS company |
| 4   | Minerals premix               | 15.5       | Holland company 0.01 % HB |
| 5   | Vitamins premix               | 4          | Holland company 0.01 % HB |
| 6   | Lysine 78.8%                  | 3.5        | American company AMD lapel |
| 7   | Methionine 99%                | 8          | Evenik Degussa company 99% pure |
| 8   | Nacl                          | 8          | Iraqi source           |
| 9   | Multi enzyme                  | 0.5        | Holland company FRA MELCO |
| 10  | Flower sun oil                | 1          | Turkish source bizace lapel |
| 11  | Anti-mycotoxins               | 0.1        | Myco CURB-R dry from KEMIN company |
| Total|                              | 100        |                        |

*Mixing by Babylon Ghadeer fodder factory (Micro dosing factory)

The poultry feeding ad libitum in four stages from the first day of the age to marketing in age 35 days as follow: from age 1-10 days a ration, from age 11-20 days a grower ration, from 21-30 days a developer ration and then from 31 days a finisher ration in mature stage. Four rations have made for every stages according to the mixture in its ingredients by Best Mix program according to the recommendation of needs in the production guide of Rose 308 strain with ratio 2.5% from every mixture. So that when adding the mixtures, the different experimental mixtures should be considered to cover the components formed by those requirements in the manual of Rose 308 (table 3).

The production feeds in before growing stage and in the growing stage as milled feeds while in developing mature stage in tablet form (4 mm).
Follow the chicken ground breeding in a hole contains 18 ground pins dimension 2×1.5 m , and prepare a necessary circumstances like heating and ventilation along period of the experiment according to the chicks age stages and the hole supply with all requirements like troughs water supplying and All chicks were subjected to a healthy preventive program like vaccines .

2.1.traits studied
Mortality record daily for all experiment replicates then they have collected at the end of the experiment for all treats then applied the following equation [5] as well as the carcass and dressing percentage with the giblet , The percentage of have calculated after carcass samples of each replicator and cleaning and removing giblet after that the carcass have weighted with the eaten internal intestines by sensitive electronic balance then the equation that [6] have applied:

\[
\text{Dressing percentage (\%)} = \frac{\text{Weight of cleaned carcass (g)}}{\text{Live body weight (g)}} \times 100
\]

Relative weight for main and secondary parts of slaughter body has measured and including the main part of breast and drumstick while the secondary parts were back, neck and wings the percentage of the weight of the carcass was extracted according to the [7] equation.

2.2.The statistical analysis
The data have been analytic according to Analysis of variance in one direction according to complete Random design (CRD) to study the effect of different treatments on the studied traits then the moral differences were compared between averages by poly nominal test of [8], [9] was used to analyze the data.
Table 3: The ingredients involved in the formation of an experimental stage pre-starter and starter

|                  | starter 11-20 day | Pre-starter 1-10 day | The premix type and ingredient |
|------------------|-------------------|----------------------|-------------------------------|
|                  | T9 | T8 | T7 | T6 | T5 | Max Care T4 | Provi T3 | Walli T2 | T1 local | T9 | T8 | T7 | T6 | T5 | Max Care T4 | Provi T3 | Walli T2 | T1 local |
| T9 0.625         | 0  | 1.25 | 1.25 | 1.25 | 0  | 0  | 0  | 2.5 | 0.625 | 0  | 1.25 | 1.25 | 1.25 | 0  | 0  | 0  | 2.5 | 0  | Local premix |
| T9 0.625         | 0.833 | 0  | 0  | 1.25 | 0  | 0  | 2.5 | 0  | 2.5 | 0.625 | 0  | 0  | 1.25 | 0  | 0  | 2.5 | 0  | 2.5 | Wafi premix |
| T9 0.625         | 0.333 | 0  | 1.25 | 0  | 0  | 2.5 | 0  | 0  | 0.625 | 0  | 0.833 | 0  | 1.25 | 0  | 0  | 2.5 | 0  | 0  | Provi premix |
| T9 0.625         | 0.8333 | 1.25 | 0  | 0  | 2.5 | 0  | 0  | 0  | 0.625 | 0  | 0  | 1.25 | 0  | 0  | 2.5 | 0  | 0  | Max care premix |
| T9 28.725        | 28.4 | 28.35 | 28.7 | 28.8 | 29.2 | 29.4 | 28 | 33.8 | 34 | 33.5 | 33.35 | 33.75 | 34 | 33.7 | 34.5 | 33 | Soya bean meal |
| 22.445           | 22.3 | 22.495 | 22.74 | 22.3 | 22 | 22.49 | 22.99 | 36 | 37.6 | 35.465 | 35.105 | 35.37 | 37.95 | 37.23 | 37.75 | 33 | corn |
| 30               | 30 | 30 | 30 | 30 | 30 | 30 | 30 | 21.25 | 20 | 22.5 | 25.2 | 23 | 20 | 20 | 20 | 20 | wheat |
| 10               | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 3 | 3 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | 2.5 | Flour wheat |
| 4.425            | 4.4 | 4.45 | 4.4 | 4.4 | 4.4 | 4.4 | 4.4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | Wheat bran |
| 0.375            | 0.375 | 0.375 | 0.375 | 0.5 | 0.25 | 0.5 | 0.25 | 0.375 | 0.25 | 0.375 | 0.5 | 0.375 | 0.5 | 0.25 | 0.5 | 0.25 | 0.5 | oil |
| 0.21             | 0.213 | 0.425 | 0.425 | 0.44 | 0 | 0 | 0.03 | 0.85 | 0.213 | 0 | 0.425 | 0.425 | 0.425 | 0 | 0 | 0 | 0.85 | MCP |
| 0.7625           | 0.92 | 0.575 | 1 | 0.25 | 0.85 | 1.7 | 0.2 | 0.3 | 0.462 | 0.2 | 0.325 | 0.7 | 0 | 0.45 | 1.2 | 0 | 0.2 | Lime stone |
| 0.1              | 0.1 | 0 | 0 | 1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | Toxin dry |
| 0.075            | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | 0.075 | Myco curb |
| 0.1              | 0.1 | 0.18 | 0.125 | 0.105 | 0.15 | 0.04 | 0 | 0.21 | 0.013 | 0 | 0.025 | 0.025 | 0.03 | 0 | 0 | 0 | 0.05 | lysine |
| 0.16             | 0.15 | 0.165 | 0.165 | 0.19 | 0.13 | 0.13 | 0.18 | 0.2 | 0.35 | 0.12 | 0.35 | 0.145 | 0.16 | 0.1 | 0.12 | 0.15 | 0.15 | methionine |
| 0.0875           | 0.08 | 0.085 | 0.09 | 0.1 | 0.07 | 0.08 | 0.1 | 0.1 | 0.05 | 0.13 | 0.05 | 0.08 | 0 | 0.05 | 0.05 | 0.15 | 0.05 | salt |
| 0.025            | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | 0.025 | Alicine pure |
| 100              | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | total |
| 3017             | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | 3017 | Kcal / Energy |
| 21.53            | 21.52 | 21.57 | 21.55 | 21.52 | 21.51 | 21.45 | 21.56 | 21.57 | 22.69 | 22.74 | 22.8 | 22.78 | 22.79 | 22.75 | 22.71 | 22.73 | 22.84 | % / Protein |
| 407.9            | 408.8 | 406.46 | 406.4 | 408.7 | 407.9 | 414.6 | 406.9 | 388.50 | 386.60 | 382.5 | 377.78 | 380.17 | 391.6 | 394.52 | 386.8 | 382.8 | $ / Price |
Table 4: The ingredients involved in the formation ninth experimental stage growth and finisher

| Finisher 31 – marketing | Growth 31 – 30day | The premix type and ingredient |
|-------------------------|------------------|--------------------------------|
| T9 T8 T7 T6 T5 Max Care T4 Provimi T3 Wafi T2 Local T1 | T9 T8 T7 T6 T5 Max Care T4 Provimi T3 Wafi T2 Local T1 | Local premix |
| 0.625 0 1.25 1.25 1.25 0 0 0 2.5 0.625 0 1.25 1.25 1.25 0 0 0 2.5 | 0.625 0.8333 0 0 1.25 0 0 2.5 0 0.625 0.8333 0 0 1.25 0 0 2.5 | Max Care premix |
| 0.625 0.8333 0 1.25 0 0 2.5 0 0 0.625 0.8333 0 1.25 0 0 2.5 0 0 | 0.625 0.8333 1.25 0 0 2.5 0 0 0.625 0.8333 1.25 0 0 2.5 0 0 | Wafi premix |
| 22.4 22.63 22.1 22.15 22.4 22.4 22.5 23 21.8 26 26.55 26.15 25.95 26.42 26.5 26.1 27.04 25.8 | 25 25.5 24.435 26.375 24.275 24.12 28 23.8 24.75 24 24.26 23.835 24.55 24.45 23.37 24.8 24.6 24.3 | Soya bean meal |
| 17 16.67 17.5 16.25 17.5 17.5 15 17.5 17.5 15 15 15 15 15 15 15 15 15 | 0.625 0.8333 0 1.25 0 0 2.5 0 0 0.625 0.8333 0 1.25 0 0 2.5 0 0 | Flour wheat |
| 9 9 9 9 9 9 9 9 9 7.8 8 8 8 7.75 8 8 7.5 8 Wheat bran | 3 2.85 3 2.65 3.125 3 2.3 3 3.75 3 2.8 2.83 3 2.75 3 3 3 | off |
| 0.4 0.20 0.525 0.575 0.775 0 0.1 0.5 1.05 0.28 0 0 0.45 0.45 0 0 0 0 | 0.4 0.53 0.59 0.2 0 1.18 0.4 0 0 1.5 0.74 0.775 0.55 0.13 1.3 0.85 0 0.25 | MCP |
| 0.1 0 0.1 0.1 0.1 0.1 0.1 0 0 0 0 0 0 0 0 0 0 0 | 0.1 0 0.1 0.1 0.1 0.1 0.1 0 0 0 0 0 0 0 0 0 0 0 | Lime stone |
| 0.1 0 0.1 0.1 0.1 0.1 0.1 0 0 0 0 0 0 0 0 0 0 0 | 0.1 0 0.1 0.1 0.1 0.1 0.1 0 0 0 0 0 0 0 0 0 0 0 | Myco corp |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | lysine |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | mithionine |
| 0.075 0.07 0.075 0.05 0.125 0.05 0 0.15 0.1 0.03 0.03 0.005 0.005 0.01 0.01 0.01 0.01 | 0.075 0.07 0.075 0.05 0.125 0.05 0 0.15 0.1 0.03 0.03 0.005 0.005 0.01 0.01 0.01 0.01 | salt |
| 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 0.025 0.025 0.075 0.05 0 0.05 0 0.05 0 0.02 0.02 0.0175 0.005 0.02 0.02 0.02 0.02 | Vitamin premix |
| 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 | 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 0.0175 | Minerals premix |
| 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 | 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 100 | total |
| 3197 3199 3192 3199 3193 3200 3196 3193 3190 3156 3155 3155 3156 3156 3156 3156 3157 3157 3157 3157 3157 3157 3157 3157 3157 | 3197 3199 3192 3199 3193 3200 3196 3193 3190 3156 3155 3155 3156 3156 3156 3156 3157 3157 3157 3157 3157 3157 3157 3157 3157 | Energy / Kcal |
| 19.06 19.07 19.03 19.11 19.03 19.01 19.00 19.00 19.05 20.53 20.53 20.54 20.33 20.49 20.49 20.49 20.52 | 19.06 19.07 19.03 19.11 19.03 19.01 19.00 19.00 19.05 20.53 20.53 20.54 20.33 20.49 20.49 20.49 20.52 | Protein / % |
| 370.32 373.03 367.21 368.65 366.99 358.1 371.78 374.21 362.2 379.87 382.31 379.54 376.85 375.69 379.66 378.85 385.5 372.5 | 370.32 373.03 367.21 368.65 366.99 358.1 371.78 374.21 362.2 379.87 382.31 379.54 376.85 375.69 379.66 378.85 385.5 372.5 | Price $ /
3. Results and Discussions

3.1 Mortality

The diagram shows the Percentage of losses for the whole nine experiment treatments, if it is range between 2% - 7% all statistics indicators to Not affected the mixtures on the Percentage of losses, this meet what [10]; [11]; [12] that removing vitamins and minerals mixtures from the ration for the period 28-42 not affected on percentage of losses till in hot breeding circumstances or high humidity in the Equatorial areas, these results did not agree with [13] that to give vitamins mixture (Lisovit) produced by Australian Biomin company by injection and dosage 200 ml/1 kg from the live weigh reducing the Percentage of losses.

![Diagram showing percentage of losses (%)]

Scheme1. percentage of losses (%)

3.2 Characteristics of the Carcass

3.2.1 Dressing percentage

Dressing percentage is one of the most important measures in Poultry meat, and it expresses the amount of meat production and What is worth mentioning that the dressing percentage have affected by the live body weight at slaughter and The relationship between them is a trivial [14], the table 5 shows the dressing percentage of different treatment and the results indicated existence of significance superiority in the level of (p <0.05) for the treatment T5 that adding the local mixture with provimi mixture on the entire treatments and also it is superiority significantly compare to the rest of the treatments T5, T3 and T1 morally (p <0.05) which was its value 74.81%, 74.80% and 74.64% Respectively it is superiority T8(73.85%)and T4(73.60%) whereas similar with T7 and T9 which were the ratio 74.43% and 74.18% respectively.

The reason behind the superiority may be the importance role of vitamins and minerals in Stimulate the Enzymes digested and Enzymes responsible for metabolism and that has the positive reflected on poultry Performance and the existence of Multi enzyme Complexes in both the local mixture and the provimi and this meet what [15]; [16], [17] that the existence of these enzymes
help in breaking fibers in cells in some of ratio components, Thus, the starch granules, proteins and other nutrients are used inside the cell wall for building different tissues for poultry, from another aspect these enzymes work to decreasing substances viscosity in the Ileum consisting of multiple of non–starchy sugars with high molecular weight that is working to obstruct food digestion and low absorption of nutrient thus improving weight and the percentage of poultry dressing that feeding on diet contain multiple enzymes, these results are not meet with [18];[19].

3.2.2 The relative weight of giblets:
The eaten internal intestines as have explained by [7] including heart, liver and Proventriculus and it calls (Giblets), the table 5 shows that there are not significant different between various treatments in the percentage of eaten internal intestines and these results Compatible with results [20];[19].

| The relative weight of giblet (%) | Dressing percentage (%) | carcass weight (gm) | Live weight (gm) | Treatments |
|----------------------------------|--------------------------|---------------------|------------------|------------|
| 8.78 ±2.38                       | 74.64 ± 0.26             | 1754                | 2350             | T1         |
| 6.23 ±0.71                       | 74.18 ± 0.18             | 1683.8              | 2270             | T2         |
| 6.73 ±0.47                       | 74.80 ± 0.25             | 1776.5              | 2375             | T3         |
| 6.83 ±0.37                       | 73.60 ± 0.08             | 1652.3              | 2245             | T4         |
| 6.64 ±1.42                       | 74.81 ± 0.29             | 1695                | 2266             | T5         |
| 5.69 ±0.46                       | 76.57 ± 0.02             | 1769.5              | 2311             | T6         |
| 5.92 ±0.23                       | 74.43 ± 0.17             | 1731                | 2326             | T7         |
| 7.88 ±0.22                       | 73.85 ± 0.16             | 1637                | 2217             | T8         |
| 5.85 ±0.00                       | 74.18 ± 0.32             | 1746.9              | 2355             | T9         |
| N, S                             | *                        |                     |                  | Morality   |

* : The different letters within the same column mean that there are significant differences between the averages at the probability level (P<0.05).
N.S: There was no significant difference between the mean values

3.2.3 The relative weight of major and secondary of carcass pieces:
Table (6) shows the relative weight of major and minor experience treatment of carcass pieces, the results indicate significant difference between various treatments in breast and thigh, wings, neck and the back. The results showed a significant superiority (P <0.05) in drumstick of treatment T7 (local+Max Care) it reaches 13.05% in the two treatments T1 and T6 which reaches 11.24 and 11.18 % respectively With no significant difference with the rest of the treatments This may be due to existence compound(Betaine) with range (PPM6000) in Max Care mixture and The absence of this compound in the rest of the mixtures of the experiment. This compound plays an important role in improving the weight of some carcass parts by taking advantage of methionine in the production of Muscle protein instead of Fat deposition [21] And works on the donation of similar group and also increasing of Cysteine Through many metabolic interactions[22].
Table 6. Effect of the use of local and imported premix in broiler diets in the relative weight of the main and secondary carcass (average ± standard error).

| Treatments | Nick | Wings | Back | Drumstick | Thigh | Breast |
|------------|------|-------|------|-----------|-------|--------|
| T1         | 0.53±5.54 | 0.13±8.50 | 1.05±19.1 | 0.21±11.24<sup>b</sup> | 0.58±13.34 | 0.93±33.61 |
| T2         | 0.35±5.81 | 0.16±9.97 | 0.42±19.82 | 0.36±12.32<sup>AB</sup> | 0.84±15.11 | 0.39±30.76 |
| T3         | 0.16±5.43 | 0.47±9.16 | 1.0±20.00 | 0.21±12.22<sup>AB</sup> | 0.54±14.41 | 0.55±32.06 |
| T4         | 0.69±5.45 | 0.25±9.31 | 0.22±19.23 | 0.17±11.58<sup>AB</sup> | 0.79±14.24 | 1.12±33.38 |
| T5         | 0.80±5.51 | 0.54±8.38 | 19.76±0.70 | 0.12±12.15<sup>AB</sup> | 1.18±13.97 | 2.16±33.61 |
| T6         | 0.71±5.42 | 0.82±9.38 | 0.84±20.70 | 0.41±11.18<sup>b</sup> | 0.43±14.24 | 1.68±33.40 |
| T7         | 0.29±6.05 | 0.69±8.93 | 1.65±19.56 | 0.11±13.05<sup>A</sup> | 0.88±14.07 | 0.14±32.43 |
| T8         | 0.145±5.98 | 0.12±8.67 | 0.56±19.34 | 0.52±11.80<sup>AB</sup> | 0.72±14.65 | 0.46±31.69 |
| T9         | 0.04±4.74 | 0.70±8.94 | 0.84±21.24 | 1.00±12.23<sup>AB</sup> | 1.04±15.11 | 1.86±31.90 |
| Morality   | N.S   | N.S   | N.S   | *         | N.S   | N.S    |

* The different letters within the same column mean that there are significant differences between the averages at the probability level (P<0.05).

* N.S: There was no significant difference between the mean values.

T1 = local, T2 = Wafi, T3 = Provimi, T4 = MaxCare, T5 = local + Wafi, T6 = Provimi, T7 = local + MaxCare, T8 = Wafi + Provimi + MaxCare, T9 = local + Wafi + Provimi + MaxCare.
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