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LIST OF ABBREVIATIONS

Abbreviations	Definition
A	Egg redness
ALB	Albumen
ALT	Plasma Alanine Transaminase
APO	Apo-ester
AST	Plasma Aspartate Transaminase
b*	Egg yellowness
BAE	Beetroot
BD	Basal diet
BP	Black pepper
BT	Boiled tomato
BW	Body weight
BWG	Body weight gain
Ca	Calcium
CF	Crude fiber
CHOL	Total cholesterol
CONT	Corn-soybean meal diet
CP	Crude protein
CTX	Canthaxanthin
DDGS	Dried distiller's grains with soluble
Df	Degree of freedom
DM	Dry matter
DSRP	Dried sweet red pepper
DTC	Dried tomato pomace

DSRP	Dried sweet red pepper
DTP	Dried tomato pulp
ECE	Extract of spinach
EE	Ether extract
EEf	Economical efficiency
EM	Egg mass
EP	Egg production
EST	Egg shell thickness
ESW	Egg shell weight
EW	Egg weight
FC	Feed conversion
FCR	Feed conversion ratio
FE	Feed efficiency
FI	Feed intake
g	Gram
GAE	Ginger root
GLC	Glucose
GSH	Glutathione
GSH-PX	Glutathione peroxidase
HDL	High density lipoproteins
HPLC	High- performance liquid chromatography
HU	Haugh unit
Kg	Kilogram
L*	Egg lightness
LDL	Low density lipoproteins
LE	Lutein esters
LP	Lutein powder
Ly	Lycopene
MDA	Malondialdehyde
ME	Metabolizable energy
MF	Marigold flower

MFE	Marigold flower extract
MFM	Marigold flower meal
Mg	Milligram
OP	Oleoresin paprika
P	Phosphorus
PE	Paprika extract
PHA	Phytohemagglutinin
PROT	Total protein
RCF	Roche color fan
RP	Red pepper powder
RPM	Red pepper meal
RPSOM	Red pepper seed oil meal
RYCF	Roche yolk color fan
SBM	Soybean meal
SG	Specific gravity
SGP	Sweet green pepper
SI	Shape index
SM	Silver Montazah laying hens
SOD	Antioxidant superoxide dismutase
SOV	Source of variance
SP	Saponified paprika
SRP	Sweet red pepper
TC	Total cholesterol
TG	Triglycerides
TP	Tomato puree

TRP	Turmeric rhizome powder
TWM	Tomato waste meal
ugg^{-1}	Microgram purr gram
µg	Microgram
µm	Micrometer
UT	Un boiled tomato
VLDL	Very low-density lipoproteins
WG	Weight gain
wks	Weeks
YCS	Yolk color score
YI	Yolk index

5. SUMMERY AND CONCLUSIONS

The present study was carried out at Inshas Poultry Breeding Research Station, Animal Production Research Institute, Agriculture Research Center, Ministry of Agriculture, Giza, Egypt, during the period from November 2015 to February 2016. The chemical analysis was carried out at the Laboratories of Animal production Research Institute, Agriculture Research Center, Ministry of Agriculture.

The experimental design of this work was planned to study the effect of adding different levels of lutein powder pure (LP), dried tomato pulp (DTP) and dried sweet red pepper (DSRP), as natural color additives supplementations as feed additives on some productive and reproductive performances of Silver Montazah (SM) hens as a local strain for meat and egg production.

A total number of 162 laying hens and 36 cocks of SM local strain, 40 weeks old, were chosen from the farm flock and used in this experiment. All selected birds were randomly distributed into 18 treatment groups equal in number (9 hens and two cocks / each treatment). Cocks were used to collect semen and artificially inseminated to hens for two times per week. Laying hens of each group were of nearly an equal average body weight and similar average daily egg production and were not statistically different. All birds of the experimental treatments were individually housed in wire–caged batteries (45×30×35cm), and kept under the same managerial hygienic and environmental conditions. The photoperiod during the experimental period was fixed at 16 hours daily.

A 2x3x3 factorial arrangement design was used in this experiment including two levels of LP (0 and 30 mg/kg diet), three levels of DTP

(0, 15 and 30 g/kg diet), three levels of DSRP (0, 2 and 4 g/kg diet) and their interactions were tested for 9 weeks.

Birds were fed a basal laying diet formulated to cover the nutrient requirements of SM laying hens recommendations according to **Feed Composition Tables For Animal And Poultry Feedstuffs used in Egypt (2001)**.Layers were fed either the basal diet with no supplementation (control) or supplemented with 30 mg lutein powder (LP) /kg diet, 15 & 30 g dried tomato pulp (DTP) /kg diet and 2 & 4 g dried sweet red pepper (DSRP)/kg diet. Hens were fed ad-libitum and the fresh water was available all the time during the experimental period.

Birds of each experimental group were individually weighed to the nearest gram at the start of the experiment, and then every three weeks during the experimental period (40, 43, 46 and 48 weeks of age), feed intake, feed conversion, egg production traits (egg production rate, egg weight and egg mass), egg quality traits, egg component weights and percentages, fertility and hatchability were estimated or calculated. At the end of the experimental period, a slaughter test was performed to determine carcass measurements and blood serum constituents were measured. Economical efficiency of egg production was calculated.

Results obtained could be summarized as follows:

Average live body weight of layers at the end of the experimental period was significantly ($P \leq 0.05$) affected by dietary LP levels, whereas, dietary DTP, DSRP levels had no significant effect on average live body weight of hens. The heavier live body weight was attained by layers fed 0 mg / kg diet LP and layers fed 30 g / kg diet DTP recorded the average higher LBW. While, layers fed the 0 g / kg diet DSRP showed the higher average LBW.

Dietary LP and DTP levels had significant (P≤0.01) effect on average daily feed intake of layers. However, the higher average of daily feed intake was recorded by hens fed dietary 0 mg/ kg diet LP, 0 g/ kg diet DTP level and 2 g / kg diet DSRP levels. Dried sweet red pepper levels had no significant effect on average daily FI of layers during most of experimental periods. The higher average daily FI was shown by layers fed 2 g / kg diet DSRP level.

No significant differences were found in average feed conversion of layers attributed to the dietary DTP and DSRP levels. However, the best average FCR values (3.37g feed/g egg mass) was recorded by layers fed the diet contained 0 mg/kg diet lutein powder level.

Dietary LP and DTP levels had significant (P≤0.01) effects on average egg production (EP) rate, egg weight and egg mass of layers at the end of the experimental period. While, dietary DSRP levels had no significant effect on averages of egg production rate and egg mass of layers at the end the experimental period (40-48 weeks of age). The higher averages of egg production rate and egg mass were recorded by layers fed the diet of 0 mg/kg diet LP, 30 g/kg diet DTP and 2 g/kg diet DSRP levels, while, the higher average of egg weight was recorded by hens fed the dietary 0 mg/kg diet LP, 30 g/kg diet DTP and 0 g/kg diet DSRP levels .

Averages of egg quality traits (egg shape index, egg yolk index, egg albumen index and Haugh unit) at the end of the experimental period were not significantly affected by either dietary LP, DTP or DSRP levels except shape index which was significantly (P≤0.01) affected by LP level and egg yolk index which was significantly (P≤0.01) affected by DSRP level.

Dietary supplementation of LP, DTP and DSRP showed significant ($P \leq 0.01$) effect on yolk color score at all the different experimental periods. Roche yolk color fan score increased with increasing the rate of LP, DTP and DSRP levels in the diet of laying hens.

Inclusion of LP, DTP and DSRP in the diet showed no significant effect on all averages of egg component weights and percentages of layers at 48 weeks of age, except average egg yolk weight and albumen weight which were significantly ($P \leq 0.05$ and $P \leq 0.01$ respectively) affected by feed LP supplementation. Also, DSRP levels had significant ($P \leq 0.05$) effect on albumen weight and shell percentage of layers at 48 weeks of age. While, shell thickness showed no significant effect on all the different experimental periods by all additives levels supplementation.

Average fertility percentages were significantly ($P \leq 0.01$) affected by dietary LP, DTP and DSRP levels supplementation. The higher average of fertility percentage was recorded by hens fed 30 g DTP/kg diet.

Dietary DTP levels had significant ($P \leq 0.05$) effects on averages of hatchability of total eggs set percentages. The higher averages of hatchability percentage of total eggs set were shown by layers fed 30 g DTP/kg diet.

Averages of hatchability percentage of fertile eggs were not significantly affected by either dietary DTP or DSRP levels. While, LPl levels had significant ($P \leq 0.01$) effect on hatchability of fertile eggs percentage. The higher hatchability percentages were detected in hens fed 30 mg LP/kg diet level.

Lutein powder and DSRP levels supplementation had no significant effect on all carcass traits weights and percentages estimated for layers. Absolute carcass and total edible parts weights or

percentages, of layers were significantly (P≤0.05) increased by dietary DTP levels. The higher absolute carcass and edible parts weights or percentage were found in layers fed 30 g DTP/kg diet.

Serum triglycerides, cholesterol, LDL and total lipids were significantly(P≤0.05) affected by dietary 30 mg LP/kg diet level. Whereas, allserum parameters estimated were significantly (P≤0.05) affected by dietary DTP levels except total lipids only. Also, all serum parameters estimated were significantly (P≤0.05) affected by dietary DSRP levels except albumen, A/G ratio, total lipids and liver function (ALT).The best value of total protein, albumen, globulin, A/G ratio, triglycerides, cholesterol and LDL were recorded when increased levels of LP or DTP and DSRP in the diet of laying hens.

Diets contained 0 mg LP /kg diet, 0 g DTP /kg diet and 4 g DSRP/kg diet levels recorded the higher (best) relative economical efficiency percentage for egg production .

General conclusion and recommendations:

On the light of the present results, it could be concluded that:

1-Using 30 mg LP/kg diet level in laying hens diets increased hatchability percentages.

2-Using 0mg / kg diet LP, 30 g / kg diet DTP and 2 g / kg diet DSRP levels in lying hens diets increased live body weight, average of egg weight, averages of egg production rate and egg mass, fertility percentage, averages of total eggs set percentages and absolute carcass and edible parts weights or percentages

3-Using 2 g / kg diet DSRP level in lying hens diets increased the average daily feed intake .

4- yolk color score increased with increasing the rate of LP, DTP and DSRP levels in the diet of laying hens.

5- Diets contained 0mg LP/kg diet, 0g DTP /kg diet and 4 g DSRP /kg diet levels recorded the higher (best) relative economic efficiency percentage for egg production .