

Table (2): Effect of dietary energy levels with or without selenium and choline supplementation on live body weight (LBW, g), live body weight gain (LBWG, g) and feed intake (FI, g) of broiler chickens.

Item	LBW, g (age, days)				LBWG, g (age period, days)				FI, g (age period, days)			
	6	12	24	41	6-12	13-24	25-41	6-41	6-12	13-24	25-41	6-41
Level of metabolizable energy (ME, Kcal./Kg diet (L))												
Recommended (R)	144.03	276.47	865.27	1933.50 ^b	134.65	587.05	1037.62 ^b	1786.48 ^b	203.43 ^b	1038.52 ^b	2680.60 ^b	3925.19 ^b
R-150	144.56	276.14	852.01	2052.56 ^a	131.33	575.23	1164.44 ^a	1904.46 ^a	208.70 ^a	1063.18 ^a	2741.38 ^a	4015.12 ^a
SEM ¹	1.67	3.17	10.00	27.09	2.10	8.35	22.93	26.67	0.10	4.87	13.51	16.07
P-value	0.829	0.944	0.374	0.005	0.289	0.342	<0.001	0.004	<0.001	0.001	0.003	<0.001
Type of addition (T)												
Without ²	144.40	275.20	844.15	1952.13	130.30 ^b	568.95	1071.43	1804.63	193.79 ^d	1040.28	2660.85 ^c	3898.63 ^c
Selenium (Se) ³	143.73	282.98	872.03	1988.40	141.33 ^a	586.08	1087.23	1840.93	204.50 ^c	1064.39	2787.44 ^a	4063.04 ^a
Choline ⁴	145.06	274.00	858.74	2016.17	128.94 ^b	584.54	1124.27	1870.55	209.00 ^b	1044.50	2650.13 ^c	3903.63 ^c
Mixture ⁵	143.99	273.05	859.64	2015.42	131.38 ^{ab}	584.99	1121.18	1865.77	216.97 ^a	1054.24	2745.54 ^b	4015.33 ^b
SEM	2.36	4.53	13.95	38.32	2.96	11.65	32.42	37.72	0.14	6.89	19.10	22.72
P-value	0.984	0.416	0.593	0.642	0.018	0.703	0.640	0.630	<0.001	0.076	<0.001	<0.001
L × T (treatments)												
R	Without	144.95	264.50	850.95	1892.53	119.55 ^e	586.45	1008.20	1745.67	186.05 ^g	1031.80 ^{cd}	2636.36 ^c
	Selenium	142.20	286.30	890.22	1960.00	148.26 ^a	600.56	1036.87	1811.47	204.86 ^d	1068.53 ^{ab}	2748.45 ^{ab}
	Choline	145.62	277.00	868.20	1971.73	131.38 ^{bcd}	590.80	1079.93	1825.60	205.90 ^c	1029.14 ^{cd}	2662.47 ^{bc}
	Mixture	143.33	278.10	851.70	1909.73	139.40 ^{abc}	570.40	1025.47	1763.20	216.90 ^a	1024.62 ^e	2675.13 ^{bc}
R-150	Without	143.86	285.90	837.35	2011.73	141.05 ^{ab}	551.45	1134.67	1863.60	201.52 ^f	1048.76 ^{bcd}	2685.33 ^{bc}
	Selenium	145.25	279.65	853.83	2016.80	134.40 ^{bcd}	571.61	1137.60	1870.40	204.15 ^e	1060.25 ^{abc}	2826.44 ^a
	Choline	144.50	271.00	849.29	2060.60	126.50 ^{cde}	578.29	1168.60	1915.50	212.10 ^b	1059.86 ^{abc}	2637.80 ^c
	Mixture	144.64	268.00	867.57	2121.11	123.36 ^{de}	599.57	1216.89	1968.33	217.05 ^a	1083.86 ^a	2815.95 ^a
SEM		3.37	6.41	19.73	54.19	4.19	16.47	45.85	53.34	0.20	9.86	27.35
P-value		0.914	0.062	0.672	0.604	<0.001	0.265	0.758	0.636	<0.001	0.013	0.050

^{a-g} Means in a column with different superscripts differ significantly ($P \leq 0.05$).

¹ Pooled SEM

² without Se or choline supplementation

³ 0.1 mg Se /Kg diet

⁴ 0.1% choline

⁵ 0.05 mg Se /Kg diet + 0.05% choline

Table (3): Effect of dietary energy levels with or without selenium and choline supplementation on feed conversion (FC), crude protein conversion (CPC) and caloric conversion ratio (CCR) of broiler chickens.

Item			FC, g (age period, days)				CPC (age period, days)				CCR (age period, days)			
			6-12	13-24	25-41	6-41	6-12	13-24	25-41	6-41	6-12	13-24	25-41	6-41
Level of metabolizable energy (ME, Kcal./Kg diet (L))														
Recommended (R)			1.544 ^b	1.799	2.655 ^a	1.956	0.325 ^b	0.345	0.480 ^a	0.375	4.618	5.574	8.437 ^a	6.078 ^a
R-150			1.629 ^a	1.878	2.410 ^b	1.920	0.345 ^a	0.358	0.435 ^b	0.369	4.628	5.542	7.298 ^b	5.668 ^b
SEM ¹			0.030	0.030	0.060	0.020	0.010	0.010	0.010	0.010	0.080	0.090	0.180	0.080
P-value			0.031	0.74	0.007	0.324	0.017	0.122	0.007	0.389	0.933	0.810	<0.001	<0.001
Type of addition (T)														
Without ²			1.516 ^b	1.853	2.530	1.914	0.320 ^b	0.355	0.457	0.367	4.425 ^b	5.611	7.863	5.805
Selenium (Se) ³			1.483 ^b	1.850	2.666	1.958	0.313 ^b	0.353	0.482	0.375	4.321 ^b	5.589	8.280	5.938
Choline ⁴			1.660 ^a	1.821	2.397	1.907	0.351 ^a	0.348	0.433	0.367	4.838 ^a	5.502	7.446	5.772
Mixture ⁵			1.686 ^a	1.830	2.536	1.974	0.356 ^a	0.349	0.458	0.379	4.909 ^a	5.531	7.880	5.978
SEM			0.040	0.040	0.080	0.030	0.010	0.010	0.020	0.010	0.110	0.120	0.260	0.110
P-value			<0.001	0.945	0.206	0.511	<0.001	0.925	0.206	0.502	<0.001	0.930	0.212	0.525
L × T (treatments)														
R	Without		1.582 ^{bcd}	1.783	2.676	1.966	0.333 ^{bcd}	0.342	0.484	0.377	4.732 ^{ab}	5.524	8.504	6.108
	Selenium		1.414 ^d	1.812	2.756	1.957	0.298 ^d	0.347	0.498	0.374	4.230 ^c	5.615	8.759	6.086
	Choline		1.607 ^{bc}	1.775	2.508	1.925	0.338 ^{bc}	0.340	0.453	0.370	4.805 ^{ab}	5.500	7.969	5.975
	Mixture		1.573 ^{bcd}	1.826	2.679	1.978	0.331 ^{bcd}	0.350	0.484	0.379	4.705 ^{ab}	5.657	8.515	6.145
R-150	Without		1.449 ^{cd}	1.923	2.385	1.861	0.307 ^{cd}	0.368	0.431	0.356	4.117 ^c	5.697	7.222	5.501
	Selenium		1.553 ^{bcd}	1.887	2.576	1.959	0.329 ^{bcd}	0.359	0.465	0.375	4.411 ^{bc}	5.563	7.801	5.790
	Choline		1.714 ^{ab}	1.867	2.286	1.889	0.363 ^b	0.355	0.413	0.364	4.870 ^{ab}	5.503	6.923	5.570
	Mixture		1.800 ^a	1.834	2.393	1.971	0.381 ^a	0.349	0.432	0.380	5.113 ^a	5.406	7.245	5.811
SEM			0.050	0.060	0.120	0.050	0.010	0.010	0.020	0.010	0.150	0.170	0.370	0.150
P-value			0.008	0.755	0.961	0.699	0.008	0.708	0.962	0.622	0.009	0.714	0.965	0.742

^{a-d} Means in a column with different superscripts differ significantly ($P \leq 0.05$).

¹ Pooled SEM

² without Se or choline supplementation

³ 0.1 mg Se /Kg diet

⁴ 0.1% choline

⁵ 0.05 mg Se /Kg diet + 0.05% choline

Table (5): Effect of dietary energy levels with or without selenium and choline supplementation on some slaughter parameters% of broiler chickens.

Item	Live body weight (g)	Blood& feather	Total giblets	Abdominal fat	Half breast	Half rear	Breast meat	Rear meat	Carcass weight after evisceration	Dressing	Bursa	Thymus	Tibia		
													Weight	Ash	
Level of metabolizable energy (ME, Kcal./Kg diet (L))															
Recommended (R)	1934.8	7.67 ^b	5.23	1.91	17.12	14.40	88.12	86.89	62.33	67.55	0.11	0.45	0.237	45.43	
R-150	2053.9	8.65 ^a	5.02	2.09	16.71	14.48	88.30	87.78	61.78	66.80	0.10	0.38	0.220	49.13	
SEM ¹	79.84	0.27	0.25	0.32	0.36	0.33	0.42	0.77	0.55	0.47	0.01	0.04	0.010	1.25	
P-value	0.323	0.032	0.578	0.696	0.444	0.858	0.766	0.439	0.504	0.290	0.437	0.260	0.215	0.070	
Type of addition (T)															
Without ²	1956.2	8.23	5.49	2.01	16.54	14.56	88.28	87.34	60.32	65.81 ^c	0.14 ^a	0.48	0.216	46.36	
Selenium (Se) ³	1992.7	8.05	5.59	1.84	16.77	13.96	89.10	87.79	62.88	68.47 ^a	0.09 ^{bc}	0.29	0.231	47.23	
Choline ⁴	2014.0	8.03	4.88	2.40	17.07	14.13	88.24	86.67	61.29	66.17 ^{bc}	0.12 ^{ab}	0.48	0.228	49.17	
Mixture ⁵	2014.5	8.35	4.53	1.76	17.27	15.11	87.22	87.55	63.74	68.27 ^{ab}	0.07 ^c	0.40	0.240	46.36	
SEM	112.91	0.38	0.35	0.45	0.51	0.47	0.60	1.09	0.78	0.66	0.01	0.06	0.010	1.77	
P-value	0.980	0.915	0.176	0.744	0.755	0.365	0.249	0.897	0.056	0.043	0.023	0.121	0.623	0.658	
L × T (treatments)															
R	Without	1897.0	7.86	5.40	1.93	17.10	14.01	89.09	86.64	61.11	66.52	0.17	0.51	0.218	44.89
	Selenium	1964.4	7.31	5.60	2.14	17.56	14.25	89.62	89.40	64.57	70.17	0.06	0.24	0.243	46.04
	Choline	1964.0	7.81	5.23	2.07	16.64	13.68	87.74	84.82	59.89	65.11	0.13	0.54	0.241	45.05
	Mixture	1914.0	7.72	4.67	1.51	17.16	15.65	86.02	86.71	63.75	68.42	0.08	0.50	0.247	45.74
R-150	Without	2015.5	8.60	5.58	2.09	15.98	15.11	87.46	88.04	59.52	65.11	0.11	0.46	0.214	47.83
	Selenium	2021.0	8.78	5.58	1.53	15.97	13.66	88.58	86.18	61.19	66.77	0.11	0.33	0.219	48.41
	Choline	2064.0	8.25	4.54	2.74	17.50	14.59	88.74	88.52	62.69	67.23	0.12	0.42	0.216	53.28
	Mixture	2115.0	8.99	4.39	2.00	17.38	14.57	88.42	88.38	63.72	68.11	0.06	0.30	0.232	46.99
SEM	159.67	0.53	0.49	0.63	0.72	0.66	0.84	1.54	1.11	0.94	0.02	0.08	0.020	2.51	
P-value	0.973	0.765	0.828	0.755	0.347	0.323	0.139	0.224	0.109	0.095	0.128	0.394	0.917	0.544	

^{a-c} Means in a column with different superscripts differ significantly ($P \leq 0.05$).

¹ Pooled SEM

² without Se or choline supplementation

³ 0.1 mg Se /Kg diet

⁴ 0.1% choline

⁵ 0.05 mg Se /Kg diet + 0.05% choline

Table (6): Effect of dietary energy levels with or without selenium and choline supplementation on some blood parameters of broiler chickens.

Item	Hemoglobin (g/dL)	Hematocrit (Ht) %	Red blood cells (RBCs), 10 ⁶ /mm ³	Mean Cell Volume (MCVµ3)	Total leucocytes (TLC)/cmm	Lymphocyte (LYMP%)	Neutrophils%		Eosinophils (ESINO%)	Basophils (BASO%)	Glutathione peroxidase (GSH-Px), U/ml	
							SEGMENT	STAFF				
Level of metabolizable energy (ME, Kcal./Kg diet (L))												
Recommended (R)	10.91	36.38	2.71	142.79	138.70	57.33	39.42	1.63	1.63	0.00	964.39 ^a	
R-150	10.72	35.72	2.65	136.58	139.78	59.87	35.37	1.63	3.04	0.08	876.43 ^b	
SEM ¹	0.19	0.63	0.07	2.13	1.12	3.04	2.81	0.25	0.47	0.08	5.72	
P-value	0.473	0.466	0.584	0.061	0.510	0.566	0.330	1.00	0.055	0.454	0.000	
Type of addition (T)												
Without ²	10.98	36.68	2.68	141.83	136.37	57.17	39.50	1.50	1.83	0.00	900.10 ^c	
Selenium (Se) ³	10.83	36.17	2.66	137.00	142.00	63.75	31.50	1.75	3.00	0.00	948.20 ^a	
Choline ⁴	10.70	34.92	2.72	140.25	140.07	60.00	36.75	1.25	2.00	0.00	905.30 ^{bc}	
Mixture ⁵	10.75	36.42	2.67	139.67	138.52	53.50	41.83	2.00	2.50	0.17	928.03 ^{ab}	
SEM	0.24	0.79	0.09	2.69	1.42	3.85	3.56	0.31	0.60	0.09	7.24	
P-value	0.863	0.559	0.977	0.731	0.130	0.415	0.347	0.476	0.626	0.570	0.005	
L × T (treatments)												
R	Without	11.20	36.97	2.83	139.33	136.40 ^{bc}	61.00	36.67	1.00	1.33	0.00	934.87
	Selenium	10.95	37.65	2.67	141.50	142.95 ^{ab}	68.00	28.00	2.00	2.00	0.00	986.70
	Choline	10.60	33.05	2.72	146.00	134.75 ^c	56.00	41.00	1.50	1.50	0.00	952.60
	Mixture	10.90	37.87	2.61	144.33	140.70 ^{abc}	44.33	52.00	2.00	1.67	0.00	983.40
R-150	Without	10.77	36.40	2.52	144.33	136.33 ^{bc}	53.33	42.33	2.00	2.33	0.00	865.33
	Selenium	10.70	34.70	2.65	132.50	141.05 ^{abc}	59.50	35.00	1.50	4.00	0.00	909.70
	Choline	10.80	36.80	2.72	134.50	145.40 ^a	64.00	32.50	1.00	2.50	0.00	858.00
	Mixture	10.60	34.97	2.73	135.00	136.33 ^{bc}	62.67	31.67	2.00	3.33	0.33	872.67
SEM	0.34	1.12	0.12	3.81	2.01	5.44	5.04	0.44	0.84	0.13	10.24	
P-value	0.858	0.083	0.397	0.199	0.035	0.104	0.074	0.382	0.937	0.570	0.256	

^{a-c} Means in a column with different superscripts differ significantly ($P \leq 0.05$).

¹ Pooled SEM

² without Se or choline supplementation

³ 0.1 mg Se /Kg diet

⁴ 0.1% choline

⁵ 0.05 mg Se /Kg diet + 0.05% choli

