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| --- | --- | --- | --- | --- | --- | --- |
| Appendix 1. Changes in body weight (kg) in Hanwoo steers by treatment (Kim et al., 2005) | | | | | | |
|  |  |  |  |  |  |  |
| Age† (Month) | Treatments\* | | | Mean |  |  |
| T1 | T2 | T3 |  |  |
| 8 | 211.25 | 209.98 | 210.65 | 210.63 |  |  |
| 9 | 245.53 | 245.47 | 245.47 | 245.49 |  |  |
| 10 | 261.96 | 262.40 | 263.06 | 262.47 |  |  |
| 11 | 276.19 | 277.72 | 278.42 | 277.44 |  |  |
| 12 | 302.10 | 303.38 | 301.52 | 302.33 |  |  |
| 13 | 327.98 | 332.33 | 330.78 | 330.37 |  |  |
| 14 | 350.90 | 356.28 | 353.78 | 353.66 |  |  |
| 15 | 375.07 | 380.80 | 380.23 | 378.70 |  |  |
| 16 | 402.53 | 408.98 | 409.23 | 406.92 |  |  |
| 17 | 426.60 | 434.67 | 433.20 | 431.49 |  |  |
| 18 | 450.80 | 458.30 | 455.80 | 454.97 |  |  |
| 19 | 480.87 | 488.77 | 488.77 | 486.13 |  |  |
| 20 | 501.03 | 506.37 | 509.28 | 505.56 |  |  |
| 21 | 533.73 | 535.93 | 539.67 | 536.44 |  |  |
| 22 | 558.52 | 563.32 | 562.35 | 561.39 |  |  |
| 23 | 589.73 | 594.75 | 591.33 | 591.94 |  |  |
| 24 | 606.62 | 612.18 | 604.15 | 607.65 |  |  |
| 25 | 623.22 | 631.97 | 621.55 | 625.58 |  |  |
| 26 | 652.38 | 657.64 | 643.94 | 651.32 |  |  |
| 27 | 684.28 | 688.63 | 679.85 | 684.25 |  |  |
| 28 | 710.63 | 715.95 | 708.53 | 711.70 |  |  |

\* Treatments were divided into T1, T2 and T3 according to total digestible nutrient (TDN) level of concentrates (Kim et al., 2005)

† In this study, it was assumed that Hanwoo steers are raised for 28 months which can be divided into growing and finishing phase by treatments (T1: growing stage from 8 months to 11 months; T2: growing stage from 8 months to 12 months; T3: growing stage from 8 months to 13 months)

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| Appendix 2. Ingredients and chemical composition of concentrate used in the experimental periods (Kim et al., 2005) | | | | | | | | | | |
|  |  |  |  |  |  |  |  |  |  |  |
| Periods\* | Growing stage | Finishing stage 1 | | | Finishing stage 2 | | | Finishing stage 3 | | |
| Treatments | T1, 2, and 3 | T1 | T2 | T3 | T1 | T2 | T3 | T1 | T2 | T3 |
| Cheminal composition† | % DM basis | | | | | | | | | |
| DM | 88.4 | 88.6 | 88.1 | 89.0 | 87.1 | 86.4 | 86.5 | 86.4 | 86.6 | 86.2 |
| CP | 15.5 | 14.3 | 14.4 | 14.4 | 13.5 | 13.7 | 13.3 | 12.7 | 12.7 | 12.8 |
| EE | 2.6 | 3.2 | 3.0 | 3.0 | 3.4 | 3.4 | 3.5 | 3.7 | 3.9 | 3.2 |
| CF | 5.2 | 6.4 | 5.5 | 5.0 | 5.6 | 4.9 | 4.6 | 5.1 | 5.0 | 5.0 |
| Ash | 6.8 | 7.0 | 6.0 | 5.9 | 5.6 | 5.7 | 5.2 | 5.1 | 4.6 | 4.2 |
| NDF | 20.8 | 23.6 | 22.2 | 22.8 | 23.2 | 24.5 | 23.8 | 26.1 | 26.3 | 24.8 |
| ADF | 10.7 | 12.0 | 11.7 | 9.4 | 9.7 | 9.3 | 10.0 | 10.0 | 10.3 | 9.3 |
| Ingredients‡ |  |  |  |  |  |  |  |  |  |  |
| Corn | 25.00 | 25.01 | 25.26 | 25.01 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 | 25.00 |
| Wheat | 9.38 | 10.42 | 12.22 | 15.50 | 16.20 | 18.97 | 21.03 | 23.83 | 25.00 | 25.00 |
| Wheat. Flour | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 6.00 | 9.00 |
| Gluten feed | 12.89 | 11.37 | 11.48 | 10.00 | 5.10 | 5.00 | 5.93 | 5.87 | 3.17 | 5.45 |
| Rice polishing | - | - | - | - | 3.30 | 3.10 | 3.30 | 5.00 | 6.00 | 6.00 |
| Wheat bran | 14.50 | 15.00 | 15.00 | 12.00 | 20.00 | 18.32 | 14.30 | 15.38 | 15.28 | 11.50 |
| Cotton meal | 8.50 | 8.00 | 5.00 | 5.00 | - | - | - | - | - | - |
| Beet pulp | 5.00 | 5.00 | 5.00 | 5.00 | - | - | - | - | - | - |
| Coconut meal | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 5.00 | 6.00 | 5.00 | 4.70 | 2.35 |
| Corn germ meal | - | - | - | - | 3.00 | 3.00 | 3.00 | - | - | - |
| Sesame meal | - | - | 1.00 | 2.93 | - | - | - | - | - | - |
| Molasses | 3.50 | 3.98 | 3.00 | 3.42 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 | 4.00 |
| Limestone | 1.88 | 1.87 | 1.85 | 1.78 | 1.50 | 1.50 | 1.50 | 1.50 | 0.43 | 0.27 |
| Cattle mineral | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Min-G (NaHCO3) | 0.50 | 0.50 | 0.50 | 0.50 | 0.75 | 0.70 | 0.50 | 0.50 | 0.50 | 0.50 |
| Natufermen | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Palm kernel meal | 8.00 | 8.00 | 8.00 | 8.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 | 6.00 |
| Salt, natural | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 | 0.60 |
| Soy meal | - | - | 0.83 | - | - | - | - | - | - | - |
| Soy-hull | - | - | - | - | 2.00 | 2.00 | 2.00 | 1.00 | 2.00 | 3.00 |
| Others | 0.06 | 0.06 | 0.06 | 0.06 | 2.36 | 1.62 | 1.62 | 1.12 | 1.12 | 1.12 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 | 100.0 |

\* Finishing stage was divided into three stages accoding to total digestible nutrient (TDN) level of concentrates by treatments (Kim et al., 2005)

†,‡ Chemical composition and ingredients of concentrated used for calculating carbohydrate and gross energy (GE) content in this study;

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| Appendix 3. Daily concentrates dry matter intake (DMI, kg) in Hanwoo steers by treatment (Kim et al., 2005) | | | |
|  |  |  |  |
| Age† (Month) | Treatments\* | | |
| T1 | T2 | T3 |
| 8 | 2.61 | 2.61 | 2.60 |
| 9 | 2.94 | 2.93 | 2.92 |
| 10 | 2.52 | 2.52 | 2.51 |
| 11 | 2.83 | 2.83 | 2.83 |
| 12 | 3.51 | 3.43 | 3.43 |
| 13 | 4.56 | 4.39 | 4.16 |
| 14 | 5.22 | 5.27 | 5.09 |
| 15 | 5.82 | 5.89 | 5.86 |
| 16 | 6.17 | 6.28 | 6.24 |
| 17 | 6.36 | 6.43 | 6.47 |
| 18 | 6.75 | 6.85 | 6.86 |
| 19 | 7.16 | 7.30 | 7.27 |
| 20 | 7.38 | 7.52 | 7.48 |
| 21 | 7.74 | 7.59 | 7.61 |
| 22 | 7.77 | 7.90 | 7.45 |
| 23 | 7.88 | 7.87 | 7.66 |
| 24 | 7.61 | 7.71 | 7.60 |
| 25 | 7.61 | 7.85 | 7.70 |
| 26 | 8.22 | 8.22 | 8.01 |
| 27 | 8.12 | 8.18 | 8.07 |
| 28 | 8.12 | 8.08 | 8.16 |

\* Treatments were divided into T1, T2 and T3 according to total digestible nutrient (TDN) level of concentrates (Kim et al., 2005)

† In this study, it was assumed that Hanwoo steers are raised for 28 months which can be divided into growing and finishing phase by treatments (T1: growing stage from 8 months to 11 months; T2: growing stage from 8 months to 12 months; T3: growing stage from 8 months to 13 months)

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| --- | --- | --- | --- |
| Appendix 4. Daily forage dry matter intake (DMI, kg) in Hanwoo steers by treatment (Kim et al., 2005) | | | |
|  |  |  |  |
| Age† (Month) | Treatments\* | | |
| T1 | T2 | T3 |
| 8 | 2.66 | 2.64 | 2.70 |
| 9 | 3.85 | 3.92 | 3.99 |
| 10 | 3.46 | 3.42 | 3.47 |
| 11 | 3.62 | 3.60 | 3.57 |
| 12 | 3.45 | 3.70 | 3.66 |
| 13 | 2.43 | 2.60 | 3.25 |
| 14 | 2.40 | 2.46 | 2.28 |
| 15 | 1.83 | 1.92 | 1.75 |
| 16 | 1.90 | 1.95 | 1.98 |
| 17 | 1.71 | 1.66 | 1.79 |
| 18 | 1.72 | 1.60 | 1.67 |
| 19 | 1.70 | 1.59 | 1.61 |
| 20 | 1.48 | 1.37 | 1.36 |
| 21 | 0.87 | 0.76 | 0.82 |
| 22 | 0.59 | 0.55 | 0.58 |
| 23 | 0.56 | 0.57 | 0.59 |
| 24 | 0.57 | 0.58 | 0.60 |
| 25 | 0.58 | 0.60 | 0.62 |
| 26 | 0.72 | 0.76 | 0.76 |
| 27 | 0.75 | 0.78 | 0.79 |
| 28 | 0.72 | 0.77 | 0.78 |

\* Treatments were divided into T1, T2 and T3 according to total digestible nutrient (TDN) level of concentrates (Kim et al., 2005)

† In this study, it was assumed that Hanwoo steers are raised for 28 months which can be divided into growing and finishing phase by treatments (T1: growing stage from 8 months to 11 months; T2: growing stage from 8 months to 12 months; T3: growing stage from 8 months to 13 months)