

The Influence of Processing of Soyabeans and Sunflower Seed on their Energy and Amino Acid Availability for Poultry

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Abstract

1. The effect of heat-treatment and dehulling of full-fat soya (*Glycine max*) on AME_n, amino acid availability and broiler performance.

Heat treatment and dehulling of full-fat soya were evaluated in terms of their effect on AME_n, apparent amino acid availability and broiler performance. Four products were tested: raw whole soya (RWS), raw dehulled soya (RDS), extruded whole soya (EWS) and extruded dehulled soya (EDS). Trials were conducted to determine AME_n values and apparent amino acid availability of the products. A 42-day broiler trial was conducted to measure the effect of extrusion and dehulling on broiler performance. Test products were added to the diets at levels up to 263.2 g/kg in the starter diet and 260.0 g/kg in the finisher diet. Results indicated that extrusion cooking improved AME_n and apparent amino acid availability. This was reflected in the improved performance of broilers fed extruded soya as compared to raw soya. Increasing amounts of RWS and RDS led to decreases in mass and intake and poor feed conversion ratio (FCR) due to the presence of anti-nutritional factors. Broilers fed EWS were heavier, consumed more feed and had better FCR than those fed RWS or RDS. Dehulling improved AME_n (EWS: 13.75 MJ/kg vs EDS: 15.09 MJ/kg) and rendered a product with slightly higher levels of total amino acids. Broiler performance did not reflect this as there was no difference in mass, intake or FCR between broilers fed increasing levels of EWS or EDS. Lysine and arginine were less available in EDS than EWS indicating the possible over-cooking of EDS. Levels of EWS and EDS of 263.2 g/kg in the starter and 260.0 g/kg in the finisher supported maximum broiler performance.

2. The effect of heat-treatment and dehulling of full-fat sunflower (*Helianthus annuus*) on AME_n, amino acid availability and broiler performance.

Heat treatment and dehulling of full-fat sunflower were evaluated in terms of their effect on AME_n, apparent amino acid availability and broiler performance. Four products were tested: raw whole sunflower (RWSF), raw dehulled sunflower (RDSF), extruded whole sunflower (EWSF) and extruded dehulled sunflower (EDSF). Trials were conducted to determine AME_n values and apparent amino acid availability of the products. A 42-day broiler trial was conducted to measure the effect of expansion and dehulling on broiler performance. Test products were added to the diets at levels up to 115.0 g/kg in the starter diet and 181.5 g/kg in the finisher diet. Dehulling rendered a product with higher crude protein, ether extract, amino acid and AME_n values. AME_n was only slightly improved by expansion. The AME_n values obtained were: RWSF: 16.03 MJ/kg, RDSF: 18.87 MJ/kg, EWSF: 16.22 MJ/kg, EDSF: 19.49 MJ/kg. Dehulling had no effect on apparent amino acid availability. Expansion did not affect apparent amino acid availability of dehulled full-fat sunflower but had a negative influence on apparent amino acid availability of whole sunflower seeds. This highlights the possible dangers of reduced protein quality as a result of over-processing. No differences were observed in terms of mass, intake and feed conversion ratio of broilers fed any of the products during the 42-day broiler growth trial. All products supported optimum broiler performance at levels up to 115.0 g/kg in the starter diet. For the finisher diets, optimum performance was maintained at levels of 181.5 g/kg, for RDSF and EDSF, while performance of broilers fed RWSF and EWSF was optimal up to 145.2 g/kg.

Uittreksel

1. Die invloed van hitte-behandeling en ontdopping van volvetsojabone (*Glycine max*) op SME_n , skynbare aminosuur beskikbaarheid en braaikuikenprestasie.

Hitte-behandeling en ontdopping van volvetsojabone is ge-evalueer in terme van hul invloed op stikstof gekorrekteerde skynbare metaboliseerbare energie (SME_n) waardes, skynbare aminosuur beskikbaarheid en braaikuikenprestasie. Vier produkte is getoets: rou heel sojabone (RWS), rou ontdopte sojabone (RDS), geekstrueerde heel sojabone (EWS) en geekstrueerde ontdopte sojabone (EDS). Proewe is uitgevoer om die SME_n waardes en skynbare aminosuur beskikbaarheid van die vier produkte te bepaal. Gedurende 'n braaikuikengroeitoets van 42 dae is die invloed van hitte-behandeling (ekstrusie) en ontdopping op braaikuikenprestasie gemeet. Die vier toetsprodukte is ingesluit in die aanvangsdiëet teen peile van tot 263.2 g/kg en teen peile van tot 260.0 g/kg in die afrondingsdiëet. Resultate het getoon dat ekstrusie die SME_n waardes en skynbare aminosuur beskikbaarheid verbeter het. Braaikuikens wat geekstrueerde soja ontvang het, het beter gepestee as braaikuikens wat rou soja ontvang het. Verhoogte insluitings van RWS en RDS het gelei tot verlaging in massa toename en voerinname en swak voeromsetverhoudings (VOV), as gevolg van die teenwoordigheid van anti-voedings faktore. Braaikuikens wat EWS ontvang het, was swaarder, het meer ingeneem en het beter VOV gehad as die wat RWS of RDS ontvang het. Ontdopping het SME_n verhoog (EWS: 13.75 MJ/kg vs EDS: 15.09 MJ/kg) en ontdopte produkte het klein hoeveelhede meer aminosure bevat. Dit het egter nie in braaikuikenprestasie gewys nie. Daar was geen verskille in massa, voerinname en VOV tussen braaikuikens wat EWS of EDS ontvang het. Lisien en arginien was minder beskikbaar in EDS as EWS wat op die moontlike oorprosessering van EDS dui. Vlakke van EWS en EDS van 263.2 g/kg in die aanvangsdiëet en 260.0 g/kg in die afrondingsdiëet het maksimale braaikuikenprestasie ondersteun.

2. Die invloed van hitte-behandeling en ontdopping van volvetsonneblomsaad (*Helianthus annuus*) op SME_n , skynbare aminosuur beskikbaarheid en braaikuikenprestasie.

Hitte-behandeling en ontdopping van volvetsonneblomsaad is geëvalueer in terme van hul invloed op stikstof gekorrigeerde skynbare metaboliseerbare energie (SME_n) waardes, skynbare aminosuur beskikbaarheid en braaikuikenprestasie. Vier produkte is getoets: rou heel sonneblomsaad (RWS), rou ontdopte sonneblomsaad (RDS), geëkspandeerde heel sonneblomsaad (EWS) en geëkspandeerde ontdopte sonneblomsaad (EDS). Proewe is uitgevoer om die SME_n waardes en skynbare aminosuur beskikbaarheid van die vier produkte te bepaal. Gedurende 'n braaikuikengroeitoets van 42 dae is die invloed van hitte-behandeling (ekspansie) en ontdopping op braaikuikenprestasie gemeet. Die vier toetsprodukte is ingesluit in die aanvangsdieet teen peile van tot 115.0 g/kg en teen peile van tot 181.5 g/kg in die afrondingsdieet. Ontdopte sonneblomsaad het hoër peile van ruproteïene, eter-ekstrak en aminosure as heel sonneblomsaad. SME_n waardes is ook hoër vir ontdopte sonneblomsaad. Hitte-behandeling het SME_n waardes effens verhoog. Die bepaalde SME_n waardes is as volg: RWSF: 16.03 MJ/kg, RDSF: 18.87 MJ/kg, EWSF: 16.22 MJ/kg, EDSF: 19.49 MJ/kg. Ontdopping het geen invloed op skynbare aminosuur beskikbaarheid gehad nie. Skynbare aminosuur beskikbaarheid van ontdopte sonneblomsaad is nie deur hitte-behandeling beïnvloed nie, terwyl die van heel sonneblomsaad negatief beïnvloed is. Dit beklemtoon die gevare van verswakke proteïene kwaliteit as gevolg van oor-prosessering. Geen verskille is opgemerk in terme van massa, voerinname en voeromset verhouding (VOV) tussen die vier produkte gedurende die braaikuikengroeitoets van 42 dae. Alle produkte het maksimale braaikuiken prestasie ondersteun in die aanvangsdieet teen vlakke van 115.0 g/kg. In die afrondingsdieet het RDSF en EDSF optimale braaikuikenprestasie onderhou teen vlakke van 181.5 g/kg, terwyl RWSF en EWSF net tot vlakke van 145.2 g/kg ingesluit kon word voor braaikuikenprestasie benadeel is.

This work is dedicated to my mom and dad, my brothers and my grandmother, and of course to the best companion in the world, Diesel.