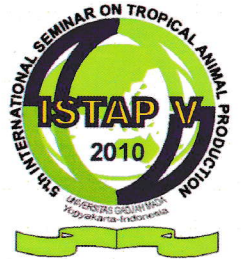




5th ISTAP

INTERNATIONAL SEMINAR
ON TROPICAL ANIMAL PRODUCTION



**“COMMUNITY EMPOWERMENT
AND TROPICAL ANIMAL INDUSTRY”**

PROCEEDINGS

Part 2

YOGYAKARTA, OCTOBER 19-22, 2010

ISBN 978-979-1215-21-3



Published by
Faculty of Animal Science, Universitas Gadjah Mada
2010

LIST OF CONTENTS

PREFACE	iii
REPORT FROM ORGANIZING COMMITTEE	iv
WELCOME ADDRESS	v
OPENING REMARKS	vi
LIST OF CONTENTS	vii

PART I

PLENARY SESSION

1.	Asian livestock: Opportunities, challenges and the response Vinoj Ahuja	1 – 5
2.	Cattle extension programs and research for tropical agriculture Dale R. ZoBell	6 – 10
3.	The revolving fund system in sustainable community development Grant Davidson, and E.R. Ørskov	11 – 18
4.	Intensification of smallholder livestock production: Is it sustainable? Hendrik M.J. Udo and Fokje Steenstra	19 – 26
5.	The development of Danish agriculture and agribusiness : Lessons to be learned in a global perspective Henning Otte Hansen and Mogens Lund	27 – 35
6.	Genome research of gut bacteria, how to analyze and how to apply? Tohru Suzuki, Kouta Sakaguchi, and Kazumasa Yasui	36 – 40
7.	Animal production in Thailand: Challenges and potentials in global market Yanin Opatpatanakit	41 – 49
8.	Improvement of forage quality by means of molecular breeding in tropical grasses Takahiro Gondo, Geñki Ishigaki, Yasuyo Himuro, Nafiatul Umami and Ryo Akashi	50 – 56
9.	Advance research in function and healthy food from animal products – antihypertensive peptides derived from meat protein hydrolysates Michio Muguruma, Jamhari, Yuny Erwanto, and Satoshi Kawahara	57 – 63

SUPPORTING PAPERS

Animal Feed and Nutrition

1.	Exploration of pathogenic and non-Pathogenic Fungi on Alfalfa (<i>Medicago sativa</i> L) Turrini Yudiarti, Sumarsono, and Didik Wisnu Widjajanto	64 - 67
2.	Organic fertilizer application on performance and production of king grass in acid soil Sumarsono, Syaiful Anwar, Didik Wisnu Widjajanto, and Susilo Budiyanto	68 - 71

3.	The effect of using earthworm (<i>Lumbricus rubellus</i>) meal additives as growth promoters on protein digestibility and performance of intestinal villi Hardi Julendra, Zuprizal, and Supadmo	72 – 78
4.	Fermentation of Jatropha kernel cake (<i>Jatropha curcas L.</i>) using varieties of fungi on its chemical compositions, concentration of phorbol ester, and digestibility Fatmawati, Hari Hartadi, and R. Djoko Soetrisno	79 – 88
5.	Effect of protected crude palm oil on rumen microbial activities and methane production Nafly C. Tiven, Lies Mira Yusiati, Rusman, and Umar Santoso	89 – 94
6.	Fermentation parameters and total gas production of some rumen protected fat-protein Lilis Hartati, Ali Agus, Budi Prasetyo Widyobroto, Lies Mira Yusiati	95 – 98
7.	Dietary energy utilization of Local Sheep fed complete feed consisting of agricultural and agroindustrial by-products E. Purbowati, C.I. Sutrisno, E. Baliarti, S.P.S. Budhi, W. Lestariana, A. Purnomoadi, and M.S. Mubarak	99 – 103
8.	Reduction of phytic acid and aflatoxin content of rice bran through fermentation <i>rhizopus</i> spp. Combined with deproteinated-chitin waste addition Ahmad Sofyan, Ema Damayanti and Hardi Julendra	104 – 108
9.	Implementation of fermented rice bran as flavor enhancer additive and its effect on feed utilization and cattle performance L. Istiqomah, A. Febrisiantosa, A. Sofyan, and E. Damayanti	109 – 114
10.	The use of kume grass (<i>sorghum plumosum</i> var. <i>Timorensis</i>) bioconverted with white-rot fungi (<i>pleurotus ostreatus</i>) fed on Local Goat in East Nusa Tenggara S. Ghunu, T.O. Dami Dato, M.A. Hilakore, J.J.A. Ratuwaloe, and Y.L. Henuk	115 – 117
11.	The use of local-fodder based supplement and agricultural by-product for cattle Y.U.L. Sobang, S. Fattah, G.A.M. Kristina Dewi, J.J.A. Ratuwaloe, and Y.L. Henuk	118 – 120
12.	The use of kume grass (<i>sorghum plumosum</i> var. <i>timorensis</i>) to substitute king grass (<i>pennisetum purpureoides</i>) fed on Bali Cattle in East Nusa Tenggara T.O. Dami Dato, S. Ghunu, M.A. Hilakore, J.J.A. Ratuwaloe, and Y.L. Henuk	121 – 123
13.	The use of zeolite in low protein diet added with critical amino acids to reduce pollution Candra Elia Puspasari, Wihandoyo, and Supadmo	124 – 148
14.	Effects of substitution of Elephant grass by corn waste and coffee pulp as basal diet on nutrient intake and digestibility in young male Ongole crossbred cattle Dicky Pamungkas, Ristianito Utomo, Nono Ngadiyono, and Muhammad Winugroho	129 – 134
15.	Effect of lactic acid bacteria inoculants applications to the quality and chemical composition silage waste of carrot plant (<i>Daucus carota</i>) Badat Muwakhid	135 – 140
16.	The content of phytoestrogen on legume plants Batseba M.W. Tiro, Suwijyo Pramono, Hari Hartadi, Djoko Soetrisno, and Endang Baliarti	141 - 145
17.	Chemical composition and digestibility(<i>in vitro</i>) of cocoa pod husk (<i>theobroma cocoa l.</i>) Fermented with <i>aspergillus niger</i> F.F. Munier, H. Hartadi, and I.G.S. Budisatria	146 – 154

18.	Intake and digestibility of feed in lamb of Sumatera composite breed when the commercial concentrate diet were substituted by gliricidia dan rice bran Dwi Yulistiani and Wisri Puastuti	155 – 158
19.	Fermentative gas production of different feeds collected during wet and dry seasons when incubated with rumen fluid from Rusa Timor (<i>Cervus timorensis</i>) M. S. Arifuddin, R. Utomo, H. Hartadi, and Damry	159 – 164
20.	Effect of fed complete feed plus on quality and milk production of dairy cow Ristianto Utomo, B.P. Widyobroto, L.M. Yusiati, R.A. Rihastuti, S.P.S. Budhi, and V.K. Dewi	165 – 170
21.	<i>In Vitro</i> gas production of fermented cacao pod (<i>Theobroma Cacao</i>) added with cellulolytic inoculum from cattle rumen fluid Chusnul Hanim, L.M. Yusiati, and V.P. Budyastuti	171 – 176
22.	Hibiscus Schizopetalus as saponin source, reduce protozoa number and increase microbial protein synthesis on in vitro sheep rumen fermentation Asih Kurniawati and Nafiatul Umami	177 – 182
23.	The effect of gliricidia or mixture of rice bran and copra meal supplementation on feed intake, digestibility and live weight gain of early weaned Bali Calves fed A, Mulato grass Marsetyo, Muhammad Ilyas Mumu, and Yohan Rusiyantono	183 – 188
24.	A comparison of feeding management practices of beef cattle smallholders in lowland and upland sites in East Java Vyta W. Hanifah, A. Priyanti, I.G.A.P. Mahendri, and R.A. Cramb	189 – 195
25.	The effect of ketepeng cina leaf (<i>cassia alata</i> l), as a source of anthraquinone, methanogenesis inhibitor agent on rumen microbial protein synthesis for beef cattle in Sedyo Rukun farmer group Lies Mira Yusiati, Zaenal Bachrudin, Chusnul Hanim, and Lila Indriana	196 – 200
26.	The effects of feed restriction severity on compensatory growth of goat kids in Bushehr Province, Iran Mahmoud Dashtizadeh, Azizollah Kamalzadeh, Mohammad Hadi Sadeghi, Amir Arsalan Kamali, and Abdolmehdi Kabirifard	201 – 207
27.	Fermentation quality of king grass (<i>Pennisetum Purpureophoides</i>) ensiled with epiphytic lactic acid bacteria and tannin of acacia B. Santoso, B. Tj. Hariadi1, H. Manik and H. Abubakar	208 - 214
28.	The effect of methionine on glutathion production to eliminate aflatoxin B1 toxicity Yunianta, Ali Agus, Nuryono, and Zuprizal	215 – 220
29.	Rice bran fermentation tecnology and soya bean oil suplementation of transfer protection fatty acid omega-3 of unsaturated fatty acids conten of milk dairy cow Sudibya	221 - 226
30.	Growth performance and blood profile of african cat fish fed sweet potato (<i>ipomoea batatas</i>) leaf meal Olaniyi Christianah Oludayo	227 – 232
31.	Application of complete feed formulated from agriculture by-products with undergraded protein supplementation on beef cattle productivity Bambang Suhartanto, B.P. Widyobroto, I.G.S. Budisatria, Kustantinah, and R. Utomo	233- 238

32.	The effect of green tea extract (<i>camellia sinensis</i>) supplementation on blood profiles and lipid oxidation in broilers fed high pufa diet Isti Astuti, Supadmo, Sugeng Riyanto, Supriyadi	239 - 242
33.	The role of lactic acid bacteria on silage duration process and rumen content silage quality Isnandar, R. Utomo, S. Chuzaemi, E. Sutariningsih, and L.M. Yusiati	243 - 249
34.	Replacing enzose by corn grains: impact on nutrients utilization and weight gain in growing buffalo calves M.Nisa, M.Aasif Shahzad, and M.Sarwar	250 - 256
35.	Nutrients utilization, nitrogen dynamics and weight gain in growing buffalo calves fed graded replacement of urea by corn steep liquor M.Aasif Shahzad, M.Nisa, and M.Sarwar	257 - 261
36.	Production and nutritive value of mulberry hay as potential feed supplement for ruminants Z.A. Jelan and A.R. Alimon	262 - 265
37.	The retention of copper in sheep fed palm kernel cake supplemented with molybdenum, molybdenum plus sulphur and zinc A.R. Alimon, R.A. Al-kirshi and Z.A. Jelan	266 - 268
38.	Utilization of complete feed based on fermented rice straw for australian commercial cross steer on carcass and meat quality Bambang Suwignyo, Ristianito Utomo, Yuny Erwanto and Ali Agus	269 - 273
39.	The measurement of rate of passage using different pairs of alkane as markers for sheep fed hay or fresh grass A. Kustantinah, R.W. Mayes, and E.R.Orskov	274 - 281
40.	Aflatoxin m1 excretion in the milk of tropical dairy cow fed contaminated aflatoxin b1 in the diet Ali Agus, I. Khuluq, I. Sumantri, C.t. Noviandi, and Nuryono	282 - 285

Poultry Production

1.	The interaction of dietary lysine and temperature on egg laying performance of broiler breeders Abdulameer Al-Saffar	286 - 290
2.	Digestible methionine requirement for performance and carcass yield of broiler finisher N.G.A. Mulyantini	291 - 295
3.	Resource use efficiency in poultry production in Bureti District, Kenya Ngeno Vincent, B. K. Lagat, M.K. Korir, E.K. Ngeno, M.J Kipsat	296 - 302
4.	<i>In vitro</i> evaluation of phytogetic potential of seed from mango (<i>Mangifera indica</i>), moringa (<i>Moringa oleifera</i>) and sweet apple (<i>Annona squamosa</i>) for poultry Rusdi, Asriani Hasanuddin, Rosmiaty Arief	303 - 307
5.	The effect of adding vitamine C and E In native chicken semen extender stored at temperature 4 °c on semen quality and egg fertility Widya Asmarawati, Ismaya, and Tri Yuwanta	308 - 313

242	6. The effects of single lactic acid bacteria probiotic supplementation on intestinal mucosa profile and immune response in broilers Bambang Ariyadi and Sri Harimurti	314 - 319
249	7. Identification of single nucleotide polymorphism of gen insuline-like growth factor binding protein 2 on growth of native chicken Sri Sudaryati, Jafendi HP Sidadolog, Wihandoyo, and Wayan Tunas Artama	320 - 324
256	8. Cassava leaf meal inclusion in palm kernel meal diet could improve egg yolk color in post-molted native laying hens Adrizal, S. Fakhri, R. Murni, Yatno, T. Maranata, S. Asby, Yusrizal, and C. R. Angel	325 - 331
261	9. Egg production responses of laying hens to feed medicinal herbs after peak of production M. Luji Jadi, E.H.A. Juwaningsih, S.T. Temu, S.Y.F.G. Dillak, and Y.L. Henuk	332 - 334
265	10. Systems of poultry husbandry C.A. Bailey, S.Y.F.G. Dillak, S. Sembiring and Y.L. Henuk	335 - 341
268	11. Ovulation and oviposition patterns in quail (<i>Cortunix Cortunix Japonica</i>) S.Y.F.G. Dillak, A. Pigawahi, and Y.L. Henuk	342 - 345
273	12. Evaluation of tofu waste treated with fermentation and enzyme supplementation in broiler chickens B. Sundu, Baharuddin and M. Basri	346 - 349
281	13. Influence of grit on performance of local chicken under intensive management system Jublin Franzina Bale-Therik, Cytske Sabuna	350 - 353
285	14. The growth and productivity of selected kampung chicken Heti Resnawati and Tike Sartika	354 - 357
90	15. Effect of divergent selection body weight to egg production during the six generation and GH gene polymorphism quail (<i>Coturnix coturnix japonica</i>) Ning Setiati, J.H.P. Sidadolog, T. Hartatik and T. Yuwanta	358 - 363
95	16. Feeding management evaluation of duck farmer group in Brebes Heru Sasongko	364 - 367
02	17. Heterosis and combining ability for body weight and feed conversion in four genetic groups of native chicken Franky M.S. Telupere	368 - 373
07	18. The implementation of forced molting technology on rejected laying hens for the people discharged from employment (a case study at Duwet Village, Klaten, Indonesia) Ali Mursyid Wahyu Mulyono, Sri Hartati, Ahimsa Kandi Sariri, and Engkus Ainul Yakin	374 - 379
13	19. Growth performance of Maleo birds (<i>Macrocephalon maleo</i>) by Means of feeding control in the captivity Hafsah, Tri Yuwanta, and Kustono	380 - 384
	20. Egg production and quality of Kedu chicken based on plumage color that reared intensively Ismoyowati, Dadang Mulyadi Saleh, Rosidi	385 - 390
	21. Effect of indigenous lactic acid bacteria probiotics on broiler performance Sri Harimurti, Nasroedin, Endang Sutriswati Rahayu, Kurniasih	391 - 394

22.	Effects of zinc supplementation on laying performance of hens O.M.O. Idowu	395 – 397
23.	Effect of different level of rice polishing in combination with phytase and acidifier on performance and shell quality in layer chickens Bayu Sesarahardian, Osfar Sjojfan and Eko Widodo	398 - 402

PART II

Livestock Production

1.	Exterior characteristics of <i>Kejobong</i> goats kept by farmers I Gede Suparta Budisatria, Panjono, Ali Agus, Lies Mira Yusiati, and Sumadi	403 – 410
2.	The effect of goat-sharing system on the performance of farmer groups raising etawah cross bred goats – a case study in ‘Sukorejo’, Girikerto, Turi, Sleman Yuni Suranindyah, Kustantinah, and E. R. Orskov	411 – 414
3.	Growth and carcass production of Ongole grade cattle and Simmental Ongole crossbred cattle growing in a feedlot system Mateus da Cruz de Carvalho, Nono Ngadiyono, and Soeparno	415 - 422
4.	Available herbage sustainability under soil and water conservation for development of small ruminants Sutarno, Sumarsono, Widiyati Slamet, Didik Wisnu Widjajanto	423 – 426
5.	A study on some aspects of equine husbandry in the Punjab-Pakistan Arshad Iqbal, Asif Hameed, M.Younas, Bakht B.Khan and S.A.Bhatti	427 – 432
6.	Feeding strategies to increase growth of early weaned Bali calves in East Java Y.N. Anggraeny, D. Pamungkas, N.H. Krishna, S.P. Quigley, and D.P. Poppi	433 – 436
7.	Response of brahman crossbred cows and their calves kept under semi-intensive and fed them on local-fodder supplement In east Sumba Regency, East Nusa Tenggara Province S. Fattah, Y.U.L. Sobang, S.Y.F.G. Dillak, J.J.A. Ratuwaloe, and Y.L. Henuk	437 – 440
8.	The relationship between heart-chest girth, body length and shoulder height, and liveweight in Indonesian goats Asmuddin Natsir, Mawardi A. Asja, Nasrullah, Yusmasari, A. Nurhayu, Peter Murray, and Roy Murray-Prior	441 – 445
9.	Growth performance of Ongole grade (Peranakan Ongole) cattle in Indonesia Budi Haryanto and Dicky Pamungkas	446 - 451
10.	Growth of carcass and carcass component of different slaughter weight of local ram A.E. Manu, M.M. Kleden, S.A. Adjam, J.J.A. Ratuwaloe and Y.L. Henuk	452 – 454
11.	Postpartum productivity of Simmental-Ongole crossed cows of the first generation compared to Ongole crossed cows kept by farmers E.Baliarti, W.T.H.M. Christoffor, and Soenardi	455 - 459

397	12. The effect of supplementation of different lysine sources on the performance of weaned pigs From 4 up to 10 weeks of age Risel Diana H. Likadja	460 – 463
402	13. Effect of fiber source on the performance of weaned pigs from 4 up to 10 weeks of age Johanis Ly and Risel D.H. Likadja	464 – 467
	14. Influence the improvement of cattle feedlot production system to increase the welfare of feedlot farmers group in indonesia through the implementation of integrated sustainability farming system Joko Riyanto, Susi Dwi Widyawati, and Wara Pratitis	468 – 473
	15. Breeding <i>bos sondaicus</i> d'alton cattle in eastern indonesia: cattle growth Totok B. Julianto, Tanda Panjaitan, Geoffry Fordyce, and Dennis Poppi	474 – 477
410	16. Breeding Bos Javanicus d'Alton cattle in eastern Indonesia cattle control, diets, draught use and feeding Tanda Panjaitan, Geoffry Fordyce, Dennis Poppi	478 – 482
414	17. Breeding <i>Bos javanicus</i> d'Alton cattle in eastern Indonesia: Monitoring village cattle Dennis Poppi, Tanda Panjaitan, Dahlanuddin, and Geoffry Fordyce	483 – 487
422	18. Application of non linear models in estimating growth curves of body weight and sizes of Holstein-Friesian female cattle Nia Kurniawan, and Anneke Anggraeni	488 – 496
426	19. Blood lipid status of "Jawa Ekor Kurus" sheep supplemented by protected kapok seed oil Widiyanto, M. Soejono, Z. Bachruddin, H. Hartadi, and Surahmanto	497 – 501
432	20. Diversity on the exterior performance of crossbred cattle kept by farmers in central java T.S.M. Widi, I.G.S.Budisatria, E. Baliarti, H.M.J.Udo	502 – 508
436	21. Alternative control for endoparasites infection in goats by feeding fresh matured and immature leaves of terminalia catappa Mohd Azrul Lokman, and Mohd Effendy Abd. Wahid	509 – 514
440	22. Growth of nine month old male buffalo calves as affected by different crude protein and energy concentrations M. Sarwar, M. A. Shahzad, N.A.Tauqir, and M. Nisa	515 – 520
445	23. Performance of lactating buffaloes as affected by varying concentrations of essential amino acids N.A.Tauqire, M.A.Shahzad, M.Nisa, M.Sarwar, H.A. Saddiqi, M. Fayyaz, and M.A Tipu	521 - 526

Animal Physiology, Reproduction, and Genetics

4	1. Seasonal investigation of serum magnesium concentration in native cattle at Western Azerbaijan Province, Iran M.R. Valilou and A.R. Rotfi	527 – 530
9	2. Detection of <i>Toxoplasma gondii</i> based on sequence r529 and sag1 gene probe Asmarani Kusumawati, Harto Widodo, Nafratilova Septiana, and Sri Hartati	531 - 534
	3. Reproductive performance of dairy cows in Yogyakarta Province based on balanced ration given Ahmad Pramono, Kustono, and hari Hartadi	535 – 540

4.	Breeding programme development of Bali cattle at P3Bali Andoyo Supriyantono, Luqman hakim, Suyadi, and Ismudiono	541 - 546
5.	Friesian holstein imported cows: physiological character and blood composition based on altitude difference Ratna Dewi Mundingsari, Adiarto, and Soenarjo Keman	547 - 551
6.	Breeding value of Friesian Holstein bulls in PT. Naksara Kejora Rowoseneng, Temanggung, Central Java Hasyim Mulyadi, Indrawati Mei P., and RR. Mahardika N.P.	552 - 555
7.	Genetic potency of weaning weight of boerawa F1, backcross 1, and backcross 2 does at breeding centre, Tanggamus Regency, Lampung Province Sulastri	556 - 560
8.	Distribution of population and production estimate of some cattle breeds at Yogyakarta Province, Indonesia Sumadi, Tety Hartatik, and Sulastri	561 - 564
9.	In vitro fresh sperm preparation for maintaining sperm viability at storage temperature of 14°C using tannin supplementation of lamtoro leaves Mirajuddin, Kustono, Ismaya, and A. Budiyanto	565 - 571
10.	Phenotype and phylogenetic studies of local cattle in pacitan district, East Java, Indonesia Muhammad Cahyadi, and Tety Hartatik	572 - 577
11.	The exploration of genetic characteristics on Madura cattle T. Hartatik, T. S. M. Widi, Ismaya, D.T. Widayati and E. Baliarti	578 - 584
12.	Breeding <i>Bos javanicus</i> d'Alton cattle in Eastern Indonesia: Cattle reproduction Geoffry Fordyce, Tanda Panjaitan, Totok B. Julianto, Eliza Kurtz, and Dennis Poppi	585 - 589
13.	Improvement quality of Bligon goat sperm trough separation by albumen Sigit Bintara, Soenarjo Keman, Sumadi, and Ali Agus	590 - 594
14.	Correlation between plasma progesterone concentrations and fecal Progestins during the estrus cycle of Kedah Kelantan cows N. Yimer, Y. Rosnina, H. Wahid, A. A. Saharee, K. C. Yap, P. Ganesamurthi, M. Fahmi, M.M. Bukar	595 - 598
15.	Effect of PGF2 α , or CIDR on ovarian follicular development during estrous cycle in goats Muhammad Modu Bukar, Rosnina Yusoff, Abd Wahid Haron, Gurmeet Kaur Dhaliwal, Mohammed Ariff Omar, Nur Husien Yimer, Mohd Azam Khan Goriman Khan	599 - 602
16.	The use of frozen semen of Holstein-Friesian bulls with the BB genotype of the kappa casein gene in Indonesia A. Anggraeni, C. Sumantri, and E. Andreas	603 - 608
17.	Effect of haylage made of kume grass standinghay fermented with liquid palm sugar and local chicken manure on semen quality and scrotum circumference of male local goat Henderiana L.L. Belli and Nathan G.F. Katipan	609 - 613
18.	The early identification of twinning trait genes on Indonesian local beef cattle Aryogi, Endang Baliarti, Sumadi, and Kustono	614 - 622

- 546 19. Effect of bulls on pregnancy rate of estrous synchronized Brangus cows
A. Malik, H. Wahid, Y. Rosnina, A. Kasim, and M. Sabri 623 – 626
- 551 20. Analysis of Butyrophilin gene polymorphism in buffalo population in Khuzestan
Province by PCR-RFLP Technique
Beigi Nassiri, M. T. Mozafari, K. N. T. Hartatik, Fayazi, J. and Mirzadeh, K 627 – 630

555 **Technology of Animal Products**

- 560 1. The development of ripened cheese containing lactic acid bacteria: the effect on
chemical composition, acid production and sensory value
Tridjoko Wisnu Murti 631 – 637
- 564 2. The restructured of local beef of low quality with different binders, fat emulsifiers and
fortification with vitamin a in beef burger
Setiyono and Soeparno 638 – 643
- 571 3. The using of extract rabbits stomachs in the making goat milk cheese ripened with
Lactobacillus Acidophilus
Inda Dewata Sari, Nurliyani and Indratiningsih 644 – 648
- 577 4. Effect of broiler age and extraction temperature on characteristic chicken feet skin
gelatin
Muhammad Taufik, Suharjono Triatmojo, Yuny Erwanto, Umar Santoso 649 – 656
- 584 5. Quality changes of burger from vegetable, wheat flour, rice flour with fat emulsion
during frozen storage
**P.H.G.J. De Silva, R.A.U.J. Marapana, Thakshala Seresinhe, A. Kalubowila, N.
Lalantha** 657 – 662
- 589 6. Polymerization of meat and Tempeh protein using transglutaminase and their potency
as an antihypertency and antioxidant agent
Yuny Erwanto, Jamhari dan Rusman 663 – 670
- 594 7. The application of local dahlia tuber (*Dahlia pinnata L.*) as prebiotics for improving
viability of probiotics *Bifidobacterium bifidum* in yoghurt
Widodo, Nosa Septiana Anindita, Endang Wahyuni, and Indratiningsih 671 - 676

598 **Extension, Community Development and Agribusiness**

- 602 1. Elephant Camps and their impacts to community: Case study in Keud Chang, Chiang
Mai Province, Thailand
Weerapon Thongma and Budi Guntoro 677 – 682
- 608 2. Soft technology innovation for farmer empowerment to bring about practice change in
an agricultural r&d project: lesson learnt from Eastern Indonesia
Nurul Hilmianti, Elske van de Fliert, Medo Kote, Debora Kana Hau, Toni Basuki 683 – 690
- 613 3. The effects of dairy cattle ownership and farmers' demography factors on the
evacuation moving farmers' behavior at Merapi volcano area (case study at Kaliadem
Sub Village, Yogyakarta, Indonesia)
Siti Andarwati and F. Trisakti Haryadi 691 – 694

4.	Farmers' profile and exterior characteristic of female Moa Buffaloes in Moa Island, Maluku Province Justhinus Pipiana, Endang Baliarti, and I Gede Suparta Budisatria	695 – 701
5.	Economic analysis of on-farm feeding strategies to increase post-weaning live weight gain of Bali calves Atien Priyanti, Simon Quigley, Marsetyo, Dicky Pamungkas, Dahlanuddin, Esnawan Budisantoso, and Dennis Poppi	702 – 708
6.	The role of livestock service in order to cattle agribusiness development in regency of Kupang Maurinus Wilhelmus Gili Tibo	709 – 716
7.	Factors with the purchase of meat by consumers in Makassar, Sulawesi Nasrullah, Yusmasari, A. Nurhayu, Asmuddin Natsir, Mawardi A. Asja, Roy Murray-Prior, and Peter Murray	717 – 724
8.	Goat supply from Enrekang, South Sulawesi to East Kalimantan: a long and winding road Mawardi A. Asja, Asmuddin Natsir, Roy Murray-Prior, Peter Murray, Nasrullah, Yusmasari, and A. Nurhayu	725 – 732
9.	Goat meat consumption in Makassar, Sulawesi: Important for religious and cultural ceremonies, but many consider it a health risk Roy Murray-Prior, Asmuddin Natsir, Mawardi A. Asja, Nasrullah, Yusmasari, A. Nurhayu, and Peter Murray	733 – 740
10.	Marketing practices of smallholder beef cattle producers in east java I. G. A. P. Mahendri, A. Priyanti, V. W. Hanifah, and R. A. Cramb	741 – 746
11.	Empowerment of goat farming: Lessons learnt from the development of goat farming group of Peranakan Etawah Gumelar Banyumas Akhmad Sodik	747 – 752
12.	Performance of credit program to small dairy cattle development in Indonesia Rini Widiati	753 – 758
13.	Analysis of demand of broiler meat in Central Java Nurdayati, Sudj Nurtini, Masyhuri, and Rini Widiati	759 – 762
14.	Decision making model analysis of technology adoption: empirical study on milk pasteurization retailer behavior Januar Tri Sukarna, Suci Paramitasari Syahlani, and Ahmadi	763 – 766
15.	An education management model based on cognitive learning for small dairy farmers in the tropics Viriya Munprasert, Phahol Sakkat, Varaporn Punyavadee, Siriporn Kiratikarnkul and Dumrong Leenanuruksa	767 – 770
16.	Participation of women farmers on beef cattle farming management in Pandan Mulyo Group, Bantul, Yogyakarta Ida Wulandari, Budi Guntoro, and Endang Sulastri	771 – 777
17.	The sources of dairy cows and concentrate feed among the dairy farmers in Sleman Regency, Yogyakarta Endang Sulastri and Budi Guntoro	778 – 780

18. Information access among chicken and cattle farmers in Gunung Kidul Yogyakarta and Ngada East Nusa Tenggara
Budi Guntoro, Fathul Wahid, Ali Agus, and Stein Kristiansen 781 – 784

Reviews

1. The use of gewang tree (*Corypha elata* Roxb) as feed for livestock in the tropics
Maritje A. Hilakore, U Ginting-Monthe, and Y.L. Henuk 785 – 789
2. Optimizing nutrition of commercial livestock for minimal negative impact on the environment through precision feed formulation
Y.L. Henuk, S.Y.F.G. Dillak, S. Sembiring and C.A. Bailey 790 – 794
3. Performance and prospect of beef cattle development In Central Java
W. Roessali, Masyhuri, Sudi Nurtini, dan D.H. Darwanto 795 – 801
4. Livestock husbandry in India: a blessing for poor
Nizamuddin Khan, Anisur Rehman, Md. Asif Iqbal and Mohd. Sadiq Salman .. 802 – 807
5. Brown midrib resistance (BMR) corn
D. Soetrisno, M.H. Shane, C.M., Dschack, J.-S. Eun, and R.Z. Dale 808 - 814

INSTRUCTIONS TO AUTHORS

Blood lipid status of “jawa ekor kurus” sheep supplemented by protected kapok seed oil

Widiyanto,^{*1} M. Soejono,[†] Z. Bachruddin,[†] H. Hartadi,[†] and Surahmanto*

*Faculty of Animal Agriculture, Diponegoro University, Tembalang Campus, Semarang 50275 Indonesia and [†]Faculty of Animal Science, Gadjah Mada University, Jl. Fauna 3 Yogyakarta 55281 Indonesia

ABSTRACT: This investigation was conducted to study the influence of protected kapok seed oil (KSO) supplementation in its combination with rice polishing (RP) on lipid status of “jawa ekor kurus” sheep fed with field grass as basal feed. The amounts of 24 heads of meal “jawa ekor kurus” sheep were used as experimental material. Those divided into 8 treatment groups, consist of 3 heads as replication, respectively. There were two treatment factors, i.e. : KSO supplementation (factor I) and concentrate supplementation (factor II). Factor I consist of 2 levels, i.e. 0% (S0) and 10% (S1), whereas factor II consist of 4 levels, i.e. 0% (K0), 15% (K1), 30% (K2) and 45% (K3) respectively, based on dry matter (DM) consumption. Several variables were measured, namely concentrations of blood triglyceride (TG), low density lipoprotein (LDL) and high density lipoprotein (HDL) cholesterol. The collected data were statistically analyzed by analysis of variance with factorial treatment pattern (2 x 4) in completely randomized design (CRD). Supplementation of RP increase blood total cholesterol ($P < 0.05$), i.e. : 1.35 mM in S0K0 became to 1.93 mM in S0K3 treatment group, whereas its combination with protected KSO did not result in significantly variation of blood plasm cholesterol (i.e. : 1.93 up to 1.99 mM), along with increasing of HDL cholesterol (from 0.98 mM in S1K0 became to 1.21 mM in S1K3 treatment group) and decreasing of LDL cholesterol.(from 0.70 mM in S1K1 up to 0.69 mM in S1K3).

Key words: kapok seed oil, protection, rice polishing, triglyceride, cholesterol, low density lipoprotein, high density lipoprotein, sheep

INTRODUCTION

There were several constraint in increasing of small ruminant productivity in Indonesia, among other, low in demand of those meat. Consumption rate of cattle, poultry, and pig meats in Indonesia, were 56, 23, and 13% respectively, whereas consumption rate of small ruminant meat, was 5% only (Ditjen Bina Produksi Peternakan, 2006). According to Arinto (2006), the consumption rate of small ruminant meat was low, be caused cholesterol phobia issue in Indonesian community.

The effort to solved those, must be conducted, with explanation and an introduction of technology to decrease the cholesterol level in small ruminant meat, so that the acceptability of those will be increased. Polyunsaturated fatty acid (PUFA) source supplementation (in this case, protected linoleic acid), is one of alternative technology to increases those content in animal product.

According to Sardesai (1992), PUFA had a biological roles, among other in controlling of cholesterol status. Raharjo (1995) stated, there was correlation between the increasing of blood cholesterol level and saturated fatty acid consumption, and unsaturated role in decreasing of blood cholesterol level. The PUFA, in this case linoleic acid, was phosphatidylcholine component, which the main phospholipids in HDL. High density lipoprotein (HDL) can carried the cholesterol from periphery tissue as well as another lipoprotein to be oxidized in liver (Bauchart, 1992).

Investigation about the influence of PUFA in controlling of cholesterol status in sheep, can explained those mechanism in consumer of sheep meat which had been increased in its linoleic acid content by supplementation of protected PUFA source. To obtain the usefulness of unsaturated fatty acid (UFA) significantly, the supplementation of adequate protected UFA was required. Protection was required to avoid the UFA from biohydrogenation by rumen microbes (Cook, 1978; Scott and

¹ Corresponding author: widiyantowidiyanto75@yahoo.com

Ashes, 1993). Protection also useful to eliminated the negative impact of high level of UFA supplementation, namely decreasing of fiber degradability (Jenkins, 1993; Wang and Song, 2001; Aharoni *et al.*, 2004). Protection was conducted partially, in order to obtained the influence of UFA on rumen metabolism efficiently, which reflected in decreasing of acetic acid level/ propionic acid level ratio.

Kapok seed oil (KSO) is one of the potential UFA source. According to Sarosa (1990), proportion of PUFA in total lipid of KSO, was 71.95%. Amount of 54.29% from those was linoleic acid, whereas another, consist of oleic acid (43.50%) and linolenic acid (2.21%). The most of Indonesian KSO were resulted from north coastal area of Central Java, namely around of Muria Mountain, Pati and Jepara.

MATERIALS AND METHODS

The major materials used were protected kapok seed oil (KSO) as supplement, fibrous feed in this case field grass (FG) as basal feed, concentrate in this case rice polishing (RP), 24 heads of male "jawa ekor kurus" (JEK) local sheep as experimental units. The PUFA source (KSO) was used with 75% protection level. The experimental sheep age were selected about 6 months based on body weight (about 13 kg) (Sabrani and Levine, 1993). The major equipment, consist of animal balance, feed balance, analytical balance, individual pen and its equipment, venoject tubes and its needle, waterbatch, ultracentrifuge.

Protection of KSO was conducted by saponification using KOH and then was transformed to Ca salt by CaCl_2 . Amount of KOH were used was suitable for protection level, calculated based on saponification number of KSO that determined according to Cabatit method (1979). Certain amount of KSO filled into beaker glass, then to be heated up to 90°C. Amount of KOH suitable with calculation was balanced, dissolved by aquadest then added to heating KSO, while stirred for 10 minutes up to kalium soap suspension was formed. In transformation of kalium soap to Ca salt, amount of CaCl_2 calculated by stoichiometri, to be balanced and dissolved by aquadest. The CaCl_2 solution added to kalium soap suspension, while heated in waterbatch at 90°C and stirred up to Ca salt was formed. After centrifugation at 2500 rpm for 10 minutes, supernatant was removed, the precipitate was added by unprotected KSO portion, ready for used as supplement. Before to be protected, the KSO was heated previously for 4 hours at 200°C to eliminate its anti nutrition substance.

This Research was started by preparation of pen and its equipment, and treatment. Twenty four heads of experimental sheep were divided into 8 groups based on treatment combination. Each group consist of 3 heads as replications. There were 2 treatment factors, namely protected KSO supplementation as factor 1 and feeding concentrate (RP) as factor 2. Treatment factor 1 consist of 2 levels, namely without supplementation (S0) and with supplementation (S1). Treatment factor 2 consist of 4 levels, namely : 0% (K0); 15% (K1); 30% (K2) and 45% (K3).

The experiment proceeded for 3 months, including 10 days adaptation period, 10 days introduction period and 70 days observation period, while experiment, forage was fed *ad libitum*. Concentrate were fed every morning, whereas water supplied continuously. Mineral mixture consist of limestone, bone meal and salt (1 : 1 : 1) to be fed free choice (Tillman, 1978).

Feed consumption and body weight data were collected after introduction period. Balancing of body weight were conducted periodically each week, in the morning before feeding, as the base of supplementation. Blood sampling was done for determination of plasm TG and cholesterol concentrations according to Liebermann-Bauchart method (Tranggono *et al.*, 1989).

Table 1. Nutrient composition of experimental feed (dry matter basis)

Feed	CP, %	CF, %	Lipid, %	Ash, %	NFE, %
Field grass	10.16	32.66	1.37	16.58	39.23
Rice polishing	14.04	15.81	1.08	10.08	42.99

CP : crude protein; CF : crude fiber, NFE : nitrogen free extract

The collected data were analyzed statistically by analysis of variance in completely randomized design. Difference of means between treatment groups were analyzed by Duncan method (Astuti, 1980; Sugandi and Sugiarto, 1993).

RESULTS AND DISCUSSION

Triglyceride

Blood plasm TG concentration of sheep without KSO supplementation fed RP at 0; 15; 30 and 45% level (S0K0, S0K1, S0K2 and S0K3, were : 0.11; 0.15; 0.27 and 0.30 mM, respectively)(Table 3). Feeding of RP (up to 45% of ration DM) increased blood plasm TG concentration ($P<0.05$). Christie (1979_a) suggested that blood plasm TG concentration was influenced by lipid consumption. Lipid consumption as long chain fatty acid source and concentrate as source of alfa gliserol phosphat, were very important for the blood plasm TG concentration.

Table 2. Average of dry matter (DM), organic matter (OM), crude protein (CP) and lipid consumption per head per day

Treatment	DM, g	OM, g	CP, g	Lipid, g
S0K0	391	336	47	6,04
S0K1	437	379	53	16,66
S0K2	539	468	68	31,76
S0K3	548	481	71	45,21
S1K0	455	396	50	48,54
S1K1	599	519	64	73,71
S1K2	666	577	74	87,95
S1K3	612	535	71	98,87

Protected KSO supplementation to sheep without feeding of RP (S1K0) resulted in lipid consumption was 48.54 g/day (Table 2), those were equivalent to lipid consumption by sheep in S0K3 group. Blood plasm TG concentration of sheep in S1K0 treatment group were not significantly different from blood plasm TG concentration of sheep in S0K1 group, even if its lipid consumption were much higher. Those were understood, because most of fatty acids consumed by sheep in protected S1K0 group, so that most of that were absorbed as PUFA. The absorbed unsaturated fatty acids were esterified in intestinal mucosal cell was not as TG, but as phospholipids and cholesterylester (Christie, 1979; Bauchart, 1992; Ashes *et al.*, 1995). The fact showed that blood plasm TG concentration of sheep in S1K3 group (0.31%), were not significantly different from S1K2 (0.33%) and even tended to decrease, and not significantly different from blood plasm TG concentration of sheep in S0K3 and S0K2 groups. Those phenomenon supposed to be occurred because increasing of unprotected PUFA were bypassed from ruminal biohydrogenation, so that amount of esterified fatty acids became to TG were decreased. Gerson *et al.* (1985) and Pantoja *et al.* (1996) stated that decreasing of rumen fluid pH inhibited ruminal glyceride lipolysis.

Cholesterol

Blood plasm cholesterol concentration in sheep without KSO supplementation which received RP. Were higher ($P<0.05$) than those without KSO supplementation and without RP (1.54; 1.75; 1.93 mM, in S0K1, S0K2 and S0K3, respectively vs 1.35 mM in S0K0). Lipid consumption increased along with increasing of RP feeding levels, from 6.04 g in S0K0 to 16.06 ; 31.76 and 45.21 g in S0K0, S0K2 and S0K3, respectively. Those increasing of consumption were followed by the improving of its absorption, as reflected in blood plasm TG concentration. The improving of lipid absorption would be followed by rising of lipoprotein synthesis to lipid transported in blood, as

reflected by the rising of blood plasma cholesterol concentration. Those could occur because increasing of intestinal cholesterogenesis to facilitate the absorbed lipid transport.

Table 3. Blood plasma triglyceride (TG), and cholesterol levels of experimental Sheep

Supplementation	Concentrate	TG, mM	Total chol, mM	LDL chol, mM	HDL chol, mM
S0	K0	0.11 ^d	1.35 ^d	0.57 ^e	0.67 ^f
	K1	0.15 ^c	1.54 ^c	0.66 ^d	0.75 ^e
	K2	0.27 ^b	1.75 ^b	0.75 ^{bc}	0.81 ^d
	K3	0.30 ^{ab}	1.93 ^a	0.85 ^a	0.92 ^c
S1	K0	0.17 ^c	1.98 ^a	0.70 ^{cd}	0.98 ^c
	K1	0.28 ^b	1.93 ^a	0.79 ^{ab}	0.97 ^c
	K2	0.33 ^a	1.96 ^a	0.73 ^{bcd}	1.14 ^b
	K3	0.31 ^{ab}	1.99 ^a	0.69 ^{cd}	1.21 ^a
Combination average					
	S0	0.21 ^b	1.64 ^b	0.70	0.79 ^b
	S1	0.27 ^a	1.96 ^a	0.73	1.07 ^a
Combination average					
	K0	0.14 ^c	1.66 ^d	0.63 ^b	0.82 ^c
	K1	0.22 ^b	1.74 ^c	0.72 ^a	0.86 ^c
	K2	0.30 ^a	1.85 ^b	0.74 ^a	0.98 ^b
	K3	0.31 ^a	1.96 ^a	0.77 ^a	1.06 ^a

^{a,b,c,d,e,f} Different superscripts in the same column-row, showed the significantly difference (P < 0.05).

Blood plasma LDL cholesterol of sheep without KSO supplementation to total blood plasma cholesterol concentration (0.57; 0.66; 0.75 and 0.85 mM, in S0K0, S0K1, S0K2 and S0K3, respectively). Most of LDL cholesterol in ruminant reflected absorbed lipid from small intestine. The HDL cholesterol in sheep without KSO supplementation which received RP were also higher than those without KSO supplementation as well as RP (0.75; 0.81; 0.92 mM in S0K1, S0K2, S0K3 vs mM in S0K0). The increasing of RP level, enhanced the HDL cholesterol concentration. The increasing of HDL cholesterol concentration was response to the increasing of total blood plasma cholesterol, especially LDL cholesterol portion. Bauchart (1992) described that HDL facilitated the taking and/or transporting of cholesterol from extrahepatic tissues to liver.

The protected KSO supplementation to sheep without feeding RP (S1K0) resulted in non significantly different blood plasma TG concentration from sheep without KSO supplementation received 15% RP (S0K1), but its blood plasma cholesterol concentration were higher (P < 0.05) than sheep in S0K1 group (1.98 vs 1.54 mM). Those could occur because protected PUFA portion will be absorbed and stimulated the cholesterogenesis in small intestine mucosal cells. Cholesterol was synthesized, particularly in intestine further more esterified preferentially to linoleic acid of lecithin, formed cholesterylester. Esterification of cholesterol to linoleic acid in HDL in this experiment was indicated in the higher of HDL cholesterol in S1K0 group sheep than S0K1 (0.98 mM vs 0.75 mM) whereas the blood plasma cholesterol was not significantly different, namely 0.70 and 0.66 mM in S0K0 and S0K1, respectively. The protected KSO supplementation to sheep fed 15% RP (S1K1) increased lipid consumption, but its PUFA proportion were lower than those in S2K0 group, so that its LDL cholesterol was higher than S1K0 (0.79 vs 0.70 mM). The increasing of PUFA absorption in S1K2 and S1K3 caused the high of blood plasma HDL cholesterol in sheep of those treatment group (1.14 and 1.23 mM) compared to the other treatment group. The high of blood plasma HDL cholesterol concentration in S1K2 and S1K3 treatment group, were supposed because the requirement of bile acid production was increased. The uptake of LDL cholesterol by HDL caused the low of blood plasma LDL cholesterol concentration in S1K2 and S1K3 treatment group (0.73 and 0.69 mM). The increasing of the use of bile acid synthesis, caused the non significantly difference of blood plasma total cholesterol between S1K2 as well as S1K3 and S1K1 as well as S1K0 (1.96 and 1.99 mM vs 1.93 and 1.98 mM).

CONCLUSIONS

There was not variation in blood total cholesterol concentration in related to increasing of concentrate level, in KSO supplemented sheep. Supplementation of protected KSO as unsaturated fatty acid source, controlled the blood cholesterol concentration, by increasing of HDL cholesterol concentration and decreasing of LDL cholesterol concentration.

LITERATURE CITED

- Aharoni, Y., A. Orlov, and A. Brosh. 2004. Effects of high-forage content and oilseed supplementation of fattening diets on conjugated linoleic acid (CLA) and trans fatty acids profiles of beef lipid fractions. *J. Anim. Sci. and Technol.* 117 : 43 – 60.
- Arinto. 2006. Produksi dan pemasaran dalam pembangunan peternakan di Indonesia. Dalam : Utomo, R., S.P.S. Budhi, Sumadi, T. Haryadi, C.T. Noviandi. (eds.). *Menyongsong Rencana Kecukupan Daging Tahun 2010. (Prosiding Orasi dan Seminar Pelepasan Dosen Purna Tugas 2006)*. Fakultas Peternakan UGM. Yogyakarta. Pp.202-232.
- Ashes, J.R., E. Fleck, and T.W. Scott. 1995. Dietary manipulation of membrane lipids and its implications for their role in the production of second messenger. In: W.V. Engelhardt, S.L. Marek, G. Breves, D. Giesecke. (eds.). *Ruminant Physiology : Digestion, Metabolism, Growth and Reproduction*. Ferdinand Enke Verlag. Stuttgart. pp. : 373 – 385.
- Astuti, M. 1980. Rancangan Percobaan dan Analisa Statistik Bagian I (*Completely Randomized Designs*). Bagian Pemuliaan Ternak, Fakultas Peternakan UGM. Yogyakarta.
- Bauchart, D. 1992. Lipid absorption and transport in ruminant. *J. Dairy Sci.* 76. (12) : 3851 – 3860.
- Cabatit, B.C. 1979. *Laboratory Guide in Biochemistry*. 10th Ed. USA Press. Manila.
- Christie, W.W. 1979a. The composition, structure and function of lipids in the tissues of ruminant animals. In : W.W. Christie (ed.). *Lipid Metabolism in Ruminant Animals*. Pergamon Press. New York. pp. 95 – 190.
- Cook, L.J. 1978. Pemberian lemak terlindung untuk ruminansia. Dalam : *Prosiding Seminar Ruminansia*. Ditjen Peternakan & Fak. Peternakan IPB. Bogor. Indonesia. pp. 37 – 40.
- Ditjen Bina Produksi Peternakan. 2006. *Pertemuan Koordinasi Teknis Lingkup Direktorat Jenderal Bina Produksi Peternakan Wilayah Timur*. Makasar, 5 – 7 Juni 2006.
- Gerson, T., A. John, and A.S.D. King. 1985. The effect of dietary starch and fiber on the *in vitro* rates of lipolysis and biohydrogenation by sheep rumen digesta. *J. Agric. Sci.* 105 : 27 – 30.
- Jenkins, T.C. 1992. Lipid metabolism in the rumen. *J. Dairy Sci.* 76 : 3851 – 3863.
- Pantoja, J., J.L. Firkins, M.L. Eastridge, and B.L. Hall. 1996. Fatty acid digestiom in lactating dairy cows fed fats varying in degree of saturation and different fiber sources. *J. Dairy Sci.* 79 : 575 – 584.
- Rahardjo, S. 1995. Produk oksidasi lemak salah satu penyebab penyakit jantung koroner . *Majalah Agritech*. Vol. 15 No.3 : 31 – 35.
- Sardesai, V.M. 1992. Nutritional role of polyunsaturated fatty acids. *J. Nutr. Biochem.* 3 : 154 – 162.
- Sarosa, B. 1990. Minyak nabati. *Majalah Trubus*. 277 : 66.
- Scott, T.W., and Ashes, J.R. 1993. Dietary lipids for ruminants : protection, utilization and effects on remodelling of skeletal muscle phospholipids. *Australian J. Agric. Research*. 44 : 495 – 508.
- Sugandi, E. dan Sugiarto. 1993. *Rancangan Percobaan*. Andi Offset. Yogyakarta.
- Tillman, A.D. 1978. *Ilmu Makanan Ternak Ruminansia*. Fakultas Peternakan Universitas Gadjah Mada. Yogyakarta.
- Tranggono, B. Setiaji, Suhardi, Sudarmanto, Y. Marsono, A. Murdiati, I.S. Utami dan Suparmo. 1989. *Biokimia Pangan*. PAU Pangan – Gizi UGM. Yogyakarta.
- Wang, J.H., and M.K. Song. 2001. Effect of sources and levels of carbohydrate on fermentation characteristics and hydrogenation of linoleic acid by rumen bacteria *in vitro*. *Asian- Australian J. Anim. Sci.* . 14. (1) : 48 – 53.