[Skip to main content](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553%22%20%5Cl%20%22maincontent)[Accessibility help](https://www.cambridge.org/core/accessibility)

We use cookies to distinguish you from other users and to provide you with a better experience on our websites. Close this message to accept cookies or find out how to [manage your cookie settings](https://www.cambridge.org/about-us/legal-notices/cookies-policy/).

[Cambridge University Press](https://www.cambridge.org/)

* [Cambridge University Press](https://www.cambridge.org/)

* [Academic](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)

* [English Language Learning](https://www.cambridge.org/cambridgeenglish)

* [Education](https://www.cambridge.org/education)

* [Bibles](https://www.cambridge.org/bibles)

* [Digital Products](https://www.cambridge.org/digital-products)

* [About Us](https://www.cambridge.org/about-us)

* [Careers](https://www.cambridge.org/about-us/careers)

[Home](https://www.cambridge.org/core/)

Top of Form





Bottom of Form

* [**Institution login**](https://shibboleth.cambridge.org/CJOShibb2/index?app=https://www.cambridge.org/core/shibboleth?ref=/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)
* [**Register**](https://www.cambridge.org/core/register?ref=/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)
* [**Log in**](https://www.cambridge.org/core/login?ref=/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)
* [**Cart ( 0 )**](https://www.cambridge.org/core/cart)
* [Home](https://www.cambridge.org/core/)
* [Journals](https://www.cambridge.org/core/what-we-publish/journals)
* [Proceedings of the Nutrition Society](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society)
* [Volume 62 Issue 2](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/issue/FE11765C742B757F0A35E233DCCD06B3)
* Plants and plant extracts for i...
* [**English**](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)|[Français](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)

Proceedings of the Nutrition Society



Top of Form





Bottom of Form

[**Article**](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)

* Cited by [**122**](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)
* Access

* [**Volume 62**](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/volume/FE9AC268239A2B694360CBBDA6DD92F7)**,**[**Issue 2**](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/issue/FE11765C742B757F0A35E233DCCD06B3)
* May 2003 , pp. 279-290

**Plants and plant extracts for improving animal productivity**

* [Henry Greathead](https://www.cambridge.org/core/search?filters%5BauthorTerms%5D=Henry%20Greathead&eventCode=SE-AU) (a1)
	+ DOI: <https://doi.org/10.1079/PNS2002197>
	+ Published online by Cambridge University Press: 05 March 2007

Abstract

Plant secondary metabolites are a natural resource that is largely unexploited in ‘conventional’ animal production systems. They have in the past been generally considered as a source of anti-nutritional factors, and not as a source of exploitable performance-enhancing compounds. Recent and continuing changes to legislation controlling the use of animal feed additives have stimulated interest in bioactive secondary metabolites as alternative performance enhancers. They are broadly compatible with current thinking on the future of agriculture and food in Europe, and with consumer opinion. Interest has been largely on their manipulative role in the digestive and absorptive processes of the hindgut. The present paper will review the use of plants and their extracts to manipulate the rumen microbial ecosystem to improve the efficiency of rumen metabolism. The bioavailability of secondary metabolites and their actions on peripheral metabolism will be considered with a view to improving animal performance. The challenge of delivering plants and their extracts to animals outdoors in a controlled manner will be discussed. Much of what is known about the beneficial roles of plant secondary metabolites on animal performance is circumstantial and is based on tenuous data. In order to more fully exploit their bioactive properties for the benefit of animal performance, modes of action need to be understood. Uptake will be dependent on proven efficacy and consumer acceptance of assurances relating to safety, welfare and the environment.

[Export citation](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553) [Request permission](https://s100.copyright.com/AppDispatchServlet?publisherName=CUP&publication=PNS&title=Plants%20and%20plant%20extracts%20for%20improving%20animal%20productivity&publicationDate=2007-03-05&author=Henry%20Greathead&copyright=COPYRIGHT:%20%C2%A9%20The%20Nutrition%20Society%202003&contentID=10.1079/PNS2002197&startPage=279&endPage=290&orderBeanReset=True&volumeNum=62&issueNum=2)

Copyright

COPYRIGHT: © The Nutrition Society 2003

Corresponding author

**Corresponding author**: Dr Henry Greathead, fax +44 133 3433144, h.m.r.greathead@leeds.ac.uk

References

**[Hide All](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553%22%20%5Cl%20%22references)**

Aerts, RJ,Barry, TN, McNabb, WC (1999) Polyphenols and agriculture: beneficial effects of proanthocyanidins in forages. *Agriculture Ecosystems and Environment* 75, 1–12.[CrossRef](http://dx.doi.org/10.1016/S0167-8809%2899%2900062-6) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Polyphenols+and+agriculture:+beneficial+effects+of+proanthocyanidins+in+forages&publication+year=1999&author=Aerts+RJ&author=Barry+TN&author=McNabb+WC&journal=Agriculture+Ecosystems+and+Environment&volume=75&doi=10.1016/S0167-8809(99)00062-6&pages=1-12)

Agriculture and Food Research Council (1992) Nutritive requirements of ruminant animals: protein. *Nutrition Abstract Reviews* 62B, 787–835.[Google Scholar](https://scholar.google.com/scholar?q=Agriculture+and+Food+Research+Council+(1992)+Nutritive+requirements+of+ruminant+animals:+protein.+Nutrition+Abstract+Reviews+62B+787%E2%80%93835.)

Allen, PC,Lydon, J, Danforth, HD (1997) Effects of components of Artemisia annua on coccidia infections in chickens. *Poultry Science* 76, 1156–1163.[CrossRef](http://dx.doi.org/10.1093/ps/76.8.1156) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Effects+of+components+of+Artemisia+annua+on+coccidia+infections+in+chickens&publication+year=1997&author=Allen+PC&author=Lydon+J&author=Danforth+HD&journal=Poultry+Science&volume=76&doi=10.1093/ps/76.8.1156&pages=1156-1163) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9251146)

Awad, AB,Fink, CS (2000) Phytosterols as anticancer dietary components: evidence and mechanism of action. *Journal of Nutrition* 130, 2127–2130.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Phytosterols+as+anticancer+dietary+components:+evidence+and+mechanism+of+action&publication+year=2000&author=Awad+AB&author=Fink+CS&journal=Journal+of+Nutrition&volume=130&pages=2127-2130" \t "_blank) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10958802)

Bauman, DE (1984) Regulation of nutrient partitioning.In *Herbivore Nutrition in the Subtropics and Tropics*, pp. 505–524 [Gilchrist, FMC and Mackie, RI, editor]. Craighall, South Africa: Science Press.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Herbivore+Nutrition+in+the+Subtropics+and+Tropics&publication+year=1984&author=Bauman+DE&author=Gilchrist+FMC&author=Mackie+RI&pages=505-524)

Bennets HW Underwood EJ Shier FL (1946) A specific breeding problem of sheep on subterranean clover pastures in Western Australia. *Australian Veterinary Journal* 22, 2–12.[CrossRef](http://dx.doi.org/10.1111/j.1751-0813.1946.tb15473.x) | [Google Scholar](https://scholar.google.com/scholar?q=Bennets+HW+Underwood+EJ+Shier+FL+(1946)+A+specific+breeding+problem+of+sheep+on+subterranean+clover+pastures+in+Western+Australia.+Australian+Veterinary+Journal+22+2%E2%80%9312.) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/21028682)

Bergen, WG,Bates, DB (1984) lonophores – their effect on production efficiency and mode of action. *Journal of Animal Science* 58, 1465–1483.[CrossRef](http://dx.doi.org/10.2527/jas1984.5861465x) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=lonophores+%E2%80%93+their+effect+on+production+efficiency+and+mode+of+action&publication+year=1984&author=Bergen+WG&author=Bates+DB&journal=Journal+of+Animal+Science&volume=58&doi=10.2527/jas1984.5861465x&pages=1465-1483)

Briskin, DP (2000) Medicinal plants and phytomedicines. Linking plant biochemistry and physiology to human health. *Plant Physiology* 124, 507–514.[CrossRef](http://dx.doi.org/10.1104/pp.124.2.507) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Medicinal+plants+and+phytomedicines.+Linking+plant+biochemistry+and+physiology+to+human+health&publication+year=2000&author=Briskin+DP&journal=Plant+Physiology&volume=124&doi=10.1104/pp.124.2.507&pages=507-514)

Broadhurst, CL,Polansky, MM, Anderson, RA (2000) Insulin-like biological activity of culinary and medicinal plant aqueous extracts in vitro. *Journal of Agricultural and Food Chemistry* 48, 849–852.[CrossRef](http://dx.doi.org/10.1021/jf9904517) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Insulin-like+biological+activity+of+culinary+and+medicinal+plant+aqueous+extracts+in+vitro&publication+year=2000&author=Broadhurst+CL&author=Polansky+MM&author=Anderson+RA&journal=Journal+of+Agricultural+and+Food+Chemistry&volume=48&doi=10.1021/jf9904517&pages=849-852) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10725162)

Brul, S,Coote, P (1999) Preservative agents in foods – mode of action and microbial resistance mechanisms. *International Journal of Food Microbiology* 50, 1–17.[CrossRef](http://dx.doi.org/10.1016/S0168-1605%2899%2900072-0) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Preservative+agents+in+foods+%E2%80%93+mode+of+action+and+microbial+resistance+mechanisms&publication+year=1999&author=Brul+S&author=Coote+P&journal=International+Journal+of+Food+Microbiology&volume=50&doi=10.1016/S0168-1605(99)00072-0&pages=1-17) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10488839)

Butter, NL,Dawson, JM, Buttery, PJ (1999) Effects of dietary tannins on ruminants. In *Secondary Plant Products*, pp 51–70 [Caygill, JC and Meuller-Harvey, I, editor]. Nottingham: Nottingham University Press.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Secondary+Plant+Products&publication+year=1999&author=Butter+NL&author=Dawson+JM&author=Buttery+PJ&author=Caygill+JC&author=Meuller-Harvey+I&pages=51-70)

Chao, SC,Young, DG, Oberg, CJ (2000) Screening for inhibitory activity of essential oils on selected bacteria, fungi and viruses. *Journal of Essential Oil Research* 12, 639–649.[CrossRef](http://dx.doi.org/10.1080/10412905.2000.9712177) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Screening+for+inhibitory+activity+of+essential+oils+on+selected+bacteria+fungi+and+viruses&publication+year=2000&author=Chao+SC&author=Young+DG&author=Oberg+CJ&journal=Journal+of+Essential+Oil+Research&volume=12&doi=10.1080/10412905.2000.9712177&pages=639-649)

Cordell, GA (2000) Biodiversity and drug discovery – a symbiotic relationship. *Phytochemistry* 55, 463–480.[CrossRef](http://dx.doi.org/10.1016/S0031-9422%2800%2900230-2) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Biodiversity+and+drug+discovery+%E2%80%93+a+symbiotic+relationship&publication+year=2000&author=Cordell+GA&journal=Phytochemistry&volume=55&doi=10.1016/S0031-9422(00)00230-2&pages=463-480) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/11130658)

Cowan, MM (1999) Plant products as antimicrobial agents. *Clinical Microbiology Reviews* 12, 564–582.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Plant+products+as+antimicrobial+agents&publication+year=1999&author=Cowan+MM&journal=Clinical+Microbiology+Reviews&volume=12&pages=564-582) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10515903)

Cox, SD,Mann, CM,Markham, JL,Bell, HC,Gustafson, JE,Warmington, JR, Wyllie, SG (2000) The mode of antimicrobial action of the essential oil of Melaleuca alternifolia (tea tree oil). *Journal of Applied Microbiology* 88, 170–175.[CrossRef](http://dx.doi.org/10.1046/j.1365-2672.2000.00943.x) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=The+mode+of+antimicrobial+action+of+the+essential+oil+of+Melaleuca+alternifolia+(tea+tree+oil)&publication+year=2000&author=Cox+SD&author=Mann+CM&author=Markham+JL&author=Bell+HC&author=Gustafson+JE&author=Warmington+JR&author=Wyllie+SG&journal=Journal+of+Applied+Microbiology&volume=88&doi=10.1046/j.1365-2672.2000.00943.x&pages=170-175)

Cragg, GM,Newman, DJ, Snader, KM (1997) Natural products in drug discovery and development. *Journal of Natural Products* 60, 52–60.[CrossRef](http://dx.doi.org/10.1021/np9604893) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Natural+products+in+drug+discovery+and+development&publication+year=1997&author=Cragg+GM&author=Newman+DJ&author=Snader+KM&journal=Journal+of+Natural+Products&volume=60&doi=10.1021/np9604893&pages=52-60) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9014353)

Davidson, PM, Naidu, AS (2000) Phyto-phenols. In *Natural Food Antimicrobial Systems*, pp 265–294 [Naidu, AS, editor]. Boca Raton, FL: CRC Press.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Natural+Food+Antimicrobial+Systems&publication+year=2000&author=Davidson+PM&author=Naidu+AS&author=Naidu+AS&pages=265-294)

Del Campo, J,Amiot, MJ, Nguyen-The, C (2000) Antimicrobial effect of rosemary extracts. *Journal of Food Protection* 63, 1359–1368.[CrossRef](http://dx.doi.org/10.4315/0362-028X-63.10.1359) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antimicrobial+effect+of+rosemary+extracts&publication+year=2000&author=Del+Campo+J&author=Amiot+MJ&author=Nguyen-The+C&journal=Journal+of+Food+Protection&volume=63&doi=10.4315/0362-028X-63.10.1359&pages=1359-1368) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/11041135)

Dewick, PM (2002) *Medicinal Natural Products* 2nd ed Chichester, West Sussex: John Wiley & Sons Ltd.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Medicinal+Natural+Products&publication+year=2002&author=Dewick+PM)

Donnerer, J,Amann, R,Schuligoi, R, Lembeck, F (1990) Absorption and metabolism of capsaicinoids following intra-gastric administration in rats. *Naunyn-Schmiedebergs Archives of Pharmacology* 342, 357–361.[CrossRef](http://dx.doi.org/10.1007/BF00169449) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Absorption+and+metabolism+of+capsaicinoids+following+intra-gastric+administration+in+rats&publication+year=1990&author=Donnerer+J&author=Amann+R&author=Schuligoi+R&author=Lembeck+F&journal=Naunyn-Schmiedebergs+Archives+of+Pharmacology&volume=342&doi=10.1007/BF00169449&pages=357-361)

Dorman, HJD, Deans, SG (2000) Antimicrobial agents from plants: antibacterial activity of plant volatile oils. *Journal of Applied Microbiology* 88, 308–316.[CrossRef](http://dx.doi.org/10.1046/j.1365-2672.2000.00969.x) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antimicrobial+agents+from+plants:+antibacterial+activity+of+plant+volatile+oils&publication+year=2000&author=Dorman+HJD&author=Deans+SG&journal=Journal+of+Applied+Microbiology&volume=88&doi=10.1046/j.1365-2672.2000.00969.x&pages=308-316) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10736000)

Edwards, R, Gatehouse, JA (1999) *Secondary metabolism Plant Biochemistry and Molecular Biology* 193–218 [Lea, PJ and Leegood, RC, editor]. Chichester, West Sussex: John Wiley & Sons Ltd.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Secondary+metabolism+Plant+Biochemistry+and+Molecular+Biology&publication+year=1999&author=Edwards+R&author=Gatehouse+JA&author=Lea+PJ&author=Leegood+RC&pages=193-218)

European Commission (2001) Prospects for Agricultural Markets 2001–2008. http://europa.eu.int/comm/agriculture/publi/caprep/prospects2001/index\_en.htm.[Google Scholar](https://scholar.google.com/scholar?q=European+Commission+(2001)+Prospects+for+Agricultural+Markets+2001%E2%80%932008.+http://europa.eu.int/comm/agriculture/publi/caprep/prospects2001/index+en.htm.)

Evans, JA,Varney, RE, Koch, EC (1941) The mouse uterine weight method for the assay of estrogens. *Endocrinology* 28 747.[CrossRef](http://dx.doi.org/10.1210/endo-28-5-747%22%20%5Ct%20%22_blank) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=The+mouse+uterine+weight+method+for+the+assay+of+estrogens&publication+year=1941&author=Evans+JA&author=Varney+RE&author=Koch+EC&journal=Endocrinology&volume=28&doi=10.1210/endo-28-5-747)

Evans, JD, Martin, SA (2000) Effects of thymol on ruminal microorganisms. *Current Microbiology* 41, 336–340.[CrossRef](http://dx.doi.org/10.1007/s002840010145) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Effects+of+thymol+on+ruminal+microorganisms&publication+year=2000&author=Evans+JD&author=Martin+SA&journal=Current+Microbiology&volume=41&doi=10.1007/s002840010145&pages=336-340) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/11014870)

Evans, T,McDougall, J, Phillips, M (1999) *The Strategic Positioning of Major Medicinal Feed Additives Companies in Response to European Union Developments*. Edinburgh Wood: Mackenzie.[Google Scholar](https://scholar.google.com/scholar_lookup?title=The+Strategic+Positioning+of+Major+Medicinal+Feed+Additives+Companies+in+Response+to+European+Union+Developments&publication+year=1999&author=Evans+T&author=McDougall+J&author=Phillips+M)

FAOSTAT (2001) Agriculture Data: Food and Agricultural Organization of the United Nations, <http://apps.fao.org/default.htm>[Google Scholar](https://scholar.google.com/scholar?q=FAOSTAT+(2001)+Agriculture+Data:+Food+and+Agricultural+Organization+of+the+United+Nations+http://apps.fao.org/default.htm)

Farnsworth, NR,Akerele, O,Bingel, AS,Soejarto, DD, Guo, Z (1985) Medicinal plants in therapy. *Bulletin of the World Health Organization* 63, 965–981.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Medicinal+plants+in+therapy&publication+year=1985&author=Farnsworth+NR&author=Akerele+O&author=Bingel+AS&author=Soejarto+DD&author=Guo+Z&journal=Bulletin+of+the+World+Health+Organization&volume=63&pages=965-981) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/3879679)

France, J, Siddons, RC (1993) *Volatile fatty acid production Quantitative Aspects of Ruminant Digestion and Metabolism* 107–121 [Forbes, JM and France, J, editor]. Wallingford, Oxon: CAB International.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Volatile+fatty+acid+production+Quantitative+Aspects+of+Ruminant+Digestion+and+Metabolism&publication+year=1993&author=France+J&author=Siddons+RC&author=Forbes+JM&author=France+J&pages=107-121)

Frost, & Sullivan, (2000) Strategic analysis and forecasts of the essential oils market for animal health feed additives. *European Animal Health Feed Additives Markets*. 10.1–10.12. Report no. 3876–42: [www.frost.com](http://www.frost.com/)[Google Scholar](https://scholar.google.com/scholar_lookup?title=European+Animal+Health+Feed+Additives+Markets&publication+year=2000&author=Frost&author=Sullivan&pages=3876-42:)

Geuns, JMC (1978) Steroid hormones and plant growth and development. *Phytochemistry* 17, 1–14.[CrossRef](http://dx.doi.org/10.1016/S0031-9422%2800%2989671-5) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Steroid+hormones+and+plant+growth+and+development&publication+year=1978&author=Geuns+JMC&journal=Phytochemistry&volume=17&doi=10.1016/S0031-9422(00)89671-5&pages=1-14)

Gharaibeh, MN,Elayan, HH, Salhab, AS (1988) Hypoglycemic effects of Teucrium polium. *Journal of Ethnopharmacology* 24, 93–99.[CrossRef](http://dx.doi.org/10.1016/0378-8741%2888%2990139-0) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Hypoglycemic+effects+of+Teucrium+polium&publication+year=1988&author=Gharaibeh+MN&author=Elayan+HH&author=Salhab+AS&journal=Journal+of+Ethnopharmacology&volume=24&doi=10.1016/0378-8741(88)90139-0&pages=93-99) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/3199839)

Gottlieb, OR (1990) Phytochemicals – differentiation and function. *Phytochemistry* 29, 1715–1724.[CrossRef](http://dx.doi.org/10.1016/0031-9422%2890%2985002-W) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Phytochemicals+%E2%80%93+differentiation+and+function&publication+year=1990&author=Gottlieb+OR&journal=Phytochemistry&volume=29&doi=10.1016/0031-9422(90)85002-W&pages=1715-1724)

Gray, AM,Abdel-Wahab, YHA, Flatt, PR (2000) The traditional plant treatment, Sambucus nigra (elder), exhibits insulin-like and insulin-releasing actions in vitro. *Journal of Nutrition* 130, 15–20.[Google Scholar](https://scholar.google.com/scholar_lookup?title=The+traditional+plant+treatment+Sambucus+nigra+(elder)+exhibits+insulin-like+and+insulin-releasing+actions+in+vitro&publication+year=2000&author=Gray+AM&author=Abdel-Wahab+YHA&author=Flatt+PR&journal=Journal+of+Nutrition&volume=130&pages=15-20)

Gray, AM, Flatt, PR (1997) Pancreatic and extra-pancreatic effects of the traditional anti-diabetic plant, Medicago saliva (lucerne). *British Journal of Nutrition* 78, 325–334.[CrossRef](http://dx.doi.org/10.1079/BJN19970150) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Pancreatic+and+extra-pancreatic+effects+of+the+traditional+anti-diabetic+plant+Medicago+saliva+(lucerne)&publication+year=1997&author=Gray+AM&author=Flatt+PR&journal=British+Journal+of+Nutrition&volume=78&doi=10.1079/BJN19970150&pages=325-334)

Gray, AM, Flatt, PR (1998) Actions of the traditional anti-diabetic plant, Agrimony eupatoria (agrimony): effects on hyper-glycaemia, cellular glucose metabolism and insulin secretion. *British Journal of Nutrition* 80, 109–114.[CrossRef](http://dx.doi.org/10.1017/S0007114598001834) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Actions+of+the+traditional+anti-diabetic+plant+Agrimony+eupatoria+(agrimony):+effects+on+hyper-glycaemia+cellular+glucose+metabolism+and+insulin+secretion&publication+year=1998&author=Gray+AM&author=Flatt+PR&journal=British+Journal+of+Nutrition&volume=80&doi=10.1017/S0007114598001834&pages=109-114)

Gray, AM, Flatt, PR (1999) Insulin-releasing and insulin-like activity of the traditional anti-diabetic plant Coriandrum sativum (coriander). *British Journal of Nutrition* 81, 203–209.[CrossRef](http://dx.doi.org/10.1017/S0007114599000392) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Insulin-releasing+and+insulin-like+activity+of+the+traditional+anti-diabetic+plant+Coriandrum+sativum+(coriander)&publication+year=1999&author=Gray+AM&author=Flatt+PR&journal=British+Journal+of+Nutrition&volume=81&doi=10.1017/S0007114599000392&pages=203-209)

Helander, IM,Alakomi, HL,Latva-Kala, K,Mattila-Sandholm, T,Pol, I,Smid, EJ,Gorris, LGM, von Wright, A (1998) Characterization of the action of selected essential oil components on Gram-negative bacteria. *Journal of Agricultural and Food Chemistry* 46, 3590–3595.[CrossRef](http://dx.doi.org/10.1021/jf980154m) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Characterization+of+the+action+of+selected+essential+oil+components+on+Gram-negative+bacteria&publication+year=1998&author=Helander+IM&author=Alakomi+HL&author=Latva-Kala+K&author=Mattila-Sandholm+T&author=Pol+I&author=Smid+EJ&author=Gorris+LGM&author=von+Wright+A&journal=Journal+of+Agricultural+and+Food+Chemistry&volume=46&doi=10.1021/jf980154m&pages=3590-3595)

Imparl-Radosevich, J,Deas, S,Polansky, MM,Baedke, DA,Ingebritsen, TS, Anderson, RA, Graves, DJ (1998) Regulation of PTP-1 and insulin receptor kinase by fractions from cinnamon: implications for cinnamon regulation of insulin signalling. *Hormone Research* 50, 177–182.[CrossRef](http://dx.doi.org/10.1159/000023270) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Regulation+of+PTP-1+and+insulin+receptor+kinase+by+fractions+from+cinnamon:+implications+for+cinnamon+regulation+of+insulin+signalling&publication+year=1998&author=Imparl-Radosevich+J&author=Deas+S&author=Polansky+MM&author=Baedke+DA&author=Ingebritsen+TS&author=Anderson+RA&author=Graves+DJ&journal=Hormone+Research&volume=50&doi=10.1159/000023270&pages=177-182) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9762007)

Jouany, JP (1996) Effect of rumen protozoa on nitrogen utilization by ruminants. *Journal of Nutrition* 126 S1335 – S1346.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Effect+of+rumen+protozoa+on+nitrogen+utilization+by+ruminants&publication+year=1996&author=Jouany+JP&journal=Journal+of+Nutrition&volume=126" \t "_blank) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/8642481)

Kim, JM,Marshall, MR, Wei, C (1995) Antibacterial activity of some essential oil components against 5 foodborne pathogens. *Journal of Agricultural and Food Chemistry* 43, 2839–2845.[CrossRef](http://dx.doi.org/10.1021/jf00059a013) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antibacterial+activity+of+some+essential+oil+components+against+5+foodborne+pathogens&publication+year=1995&author=Kim+JM&author=Marshall+MR&author=Wei+C&journal=Journal+of+Agricultural+and+Food+Chemistry&volume=43&doi=10.1021/jf00059a013&pages=2839-2845)

Kivanc, M, Akgul, A (1986) Antibacterial activities of essential oils from Turkish spices and citrus. *Flavour and Fragrance Journal* 1, 175–179.[CrossRef](http://dx.doi.org/10.1002/ffj.2730010409) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antibacterial+activities+of+essential+oils+from+Turkish+spices+and+citrus&publication+year=1986&author=Kivanc+M&author=Akgul+A&journal=Flavour+and+Fragrance+Journal&volume=1&doi=10.1002/ffj.2730010409&pages=175-179)

Klayman, DL (1985) Qinghaosu (artemisinin) – an antimalarial drug from China. *Science* 228, 1049–1055.[CrossRef](http://dx.doi.org/10.1126/science.3887571) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Qinghaosu+(artemisinin)+%E2%80%93+an+antimalarial+drug+from+China&publication+year=1985&author=Klayman+DL&journal=Science&volume=228&doi=10.1126/science.3887571&pages=1049-1055) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/3887571)

Kubo, I,Himejima, M, Muroi, H (1991) Antimicrobial activity of flavor components of cardamom Elattaria cardamomum (Zingiberaceae) seed. *Journal of Agricultural and Food Chemistry* 39, 1984–1986.[CrossRef](http://dx.doi.org/10.1021/jf00011a020) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antimicrobial+activity+of+flavor+components+of+cardamom+Elattaria+cardamomum+(Zingiberaceae)+seed&publication+year=1991&author=Kubo+I&author=Himejima+M&author=Muroi+H&journal=Journal+of+Agricultural+and+Food+Chemistry&volume=39&doi=10.1021/jf00011a020&pages=1984-1986)

Lawrence, B & Hahn, H (2001) Swine feeding programs without antibiotics. 62nd Minnesota Nutrition Conference, <http://www.conferences.umn.edu/mn/livestok/2303/papers/022303/Windows/PDFs/13_2B6.pdf>[Google Scholar](https://scholar.google.com/scholar?q=Lawrence+B+&+Hahn+H+(2001)+Swine+feeding+programs+without+antibiotics.+62nd+Minnesota+Nutrition+Conference+http://www.conferences.umn.edu/mn/livestok/2303/papers/022303/Windows/PDFs/13+2B6.pdf)

Leng, RA,Bird, SH,Klieve, A,Choo, BS,Ball, FM,Asefa, G,Brumby, P,Mudgal, VD,Chaudhry, UB,Haryono, SU, Hendratno, N (1992) The potential for tree forage supplements to manipulate rumen protozoa to enhance protein to energy ratios in ruminants fed on poor quality forages.In *Legume Trees and other Fodder Trees as Protein Sources for Livestock* 177–191 [Speedy, A and Pugliese, PL, editor]. Rome: FAO.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Legume+Trees+and+other+Fodder+Trees+as+Protein+Sources+for+Livestock&publication+year=1992&author=Leng+RA&author=Bird+SH&author=Klieve+A&author=Choo+BS&author=Ball+FM&author=Asefa+G&author=Brumby+P&author=Mudgal+VD&author=Chaudhry+UB&author=Haryono+SU&author=Hendratno+N&author=Speedy+A&author=Pugliese+PL&pages=177-191)

Ling, WH, Jones, PJH (1995) Dietary phytosterols – a review of metabolism, benefits and side-effects. *Life Sciences* 57, 195–206.[CrossRef](http://dx.doi.org/10.1016/0024-3205%2895%2900263-6) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Dietary+phytosterols+%E2%80%93+a+review+of+metabolism+benefits+and+side-effects&publication+year=1995&author=Ling+WH&author=Jones+PJH&journal=Life+Sciences&volume=57&doi=10.1016/0024-3205(95)00263-6&pages=195-206) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/7596226)

Lu, CD, Jorgensen, NA (1987) Alfalfa saponins affect site and extent of nutrient digestion in ruminants. *Journal of Nutrition* 117, 919–927.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Alfalfa+saponins+affect+site+and+extent+of+nutrient+digestion+in+ruminants&publication+year=1987&author=Lu+CD&author=Jorgensen+NA&journal=Journal+of+Nutrition&volume=117&pages=919-927) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/3585546)

McNaughton, SJ,Tarrants, JL, McNaughton, MM, Davis, RH (1985) Silica as a defense against herbivory and a growth promoter in African grasses. *Ecology* 66, 528–535.[CrossRef](http://dx.doi.org/10.2307/1940401) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Silica+as+a+defense+against+herbivory+and+a+growth+promoter+in+African+grasses&publication+year=1985&author=McNaughton+SJ&author=Tarrants+JL&author=McNaughton+MM&author=Davis+RH&journal=Ecology&volume=66&doi=10.2307/1940401&pages=528-535)

McSweeney, CS,Palmer, B,McNeill, DM, Krause, DO (2001) Microbial interactions with tannins: nutritional consequences for ruminants. *Animal Feed Science and Technology* 91, 83–93.[CrossRef](http://dx.doi.org/10.1016/S0377-8401%2801%2900232-2) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Microbial+interactions+with+tannins:+nutritional+consequences+for+ruminants&publication+year=2001&author=McSweeney+CS&author=Palmer+B&author=McNeill+DM&author=Krause+DO&journal=Animal+Feed+Science+and+Technology&volume=91&doi=10.1016/S0377-8401(01)00232-2&pages=83-93)

Marino, M,Bersani, C, Comi, G (1999) Antimicrobial activity of the essential oils of Thymus vulgaris L. measured using a bioimpedometric method. *Journal of Food Protection* 62, 1017–1023.[CrossRef](http://dx.doi.org/10.4315/0362-028X-62.9.1017) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antimicrobial+activity+of+the+essential+oils+of+Thymus+vulgaris+L.+measured+using+a+bioimpedometric+method&publication+year=1999&author=Marino+M&author=Bersani+C&author=Comi+G&journal=Journal+of+Food+Protection&volume=62&doi=10.4315/0362-028X-62.9.1017&pages=1017-1023) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10492476)

Marriott, BM (2000) Functional foods: an ecologic perspective. *American Journal of Clinical Nutrition* 71 1728S – 1734S.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Functional+foods:+an+ecologic+perspective&publication+year=2000&author=Marriott+BM&journal=American+Journal+of+Clinical+Nutrition&volume=71" \t "_blank)

Mazur, W (1998) Phytoestrogen content in foods. *Baillieres Clinical Endocrinology and Metabolism* 12, 729–742.[CrossRef](http://dx.doi.org/10.1016/S0950-351X%2898%2980013-X) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Phytoestrogen+content+in+foods&publication+year=1998&author=Mazur+W&journal=Baillieres+Clinical+Endocrinology+and+Metabolism&volume=12&doi=10.1016/S0950-351X(98)80013-X&pages=729-742) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10384822)

Mazzanti, G,Battinelli, L, Salvatore, G (1998) Antimicrobial properties of the linalol-rich essential oil of Hyssopus officinalis L. var decumbens (Lamiaceae). *Flavour and Fragrance Journal* 13, 289–294.[CrossRef](http://dx.doi.org/10.1002/%28SICI%291099-1026%281998090%2913%3A5%3C289%3A%3AAID-FFJ750%3E3.0.CO;2-A) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antimicrobial+properties+of+the+linalol-rich+essential+oil+of+Hyssopus+officinalis+L.+var+decumbens+(Lamiaceae)&publication+year=1998&author=Mazzanti+G&author=Battinelli+L&author=Salvatore+G&journal=Flavour+and+Fragrance+Journal&volume=13&doi=10.1002/(SICI)1099-1026(1998090)13:5%3C289::AID-FFJ750%3E3.0.CO;2-A&pages=289-294)

Miyazawa, M,Watanabe, H,Umemoto, K, Kameoka, H (1998) Inhibition of acetylcholinesterase activity by essential oils of Mentha species. *Journal of Agricultural and Food Chemistry* 46, 3431–3434.[CrossRef](http://dx.doi.org/10.1021/jf9707041) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Inhibition+of+acetylcholinesterase+activity+by+essential+oils+of+Mentha+species&publication+year=1998&author=Miyazawa+M&author=Watanabe+H&author=Umemoto+K&author=Kameoka+H&journal=Journal+of+Agricultural+and+Food+Chemistry&volume=46&doi=10.1021/jf9707041&pages=3431-3434)

Moody, DE,Hancock, DL, Anderson, DB (2000) Phenethanolamine repartitioning agents. In *Farm Animal Metabolism and Nutrition*, pp. 65–96 [D'Mello, JPF, editor]. Wallingford, Oxon: CABI Publishing.[CrossRef](http://dx.doi.org/10.1079/9780851993782.0065) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Farm+Animal+Metabolism+and+Nutrition&publication+year=2000&author=Moody+DE&author=Hancock+DL&author=Anderson+DB&author=D%27Mello+JPF&pages=65-96)

Navas-Carnach, A,Laredo, MA,Cuesta, A,Anzola, H, Leon, JC (1993) Effect of supplementation with a tree legume forage on rumen function. *Livestock Research for Rural Development* 5, 58–71.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Effect+of+supplementation+with+a+tree+legume+forage+on+rumen+function&publication+year=1993&author=Navas-Carnach+A&author=Laredo+MA&author=Cuesta+A&author=Anzola+H&author=Leon+JC&journal=Livestock+Research+for+Rural+Development&volume=5&pages=58-71)

Nes, IF, Skjelkvale, R (1982) Effect of natural spices and oleoresins on Lactobacillus plantarum in the fermentation of dry sausage. *Journal of Food Science* 47, 1618–1625.[CrossRef](http://dx.doi.org/10.1111/j.1365-2621.1982.tb04996.x) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Effect+of+natural+spices+and+oleoresins+on+Lactobacillus+plantarum+in+the+fermentation+of+dry+sausage&publication+year=1982&author=Nes+IF&author=Skjelkvale+R&journal=Journal+of+Food+Science&volume=47&doi=10.1111/j.1365-2621.1982.tb04996.x&pages=1618-1625)

Newbold, CJ,El Hassan, SM,Wang, J,Ortega, ME, Wallace, RJ (1997) Influence of foliage from African multipurpose trees on activity of rumen protozoa and bacteria. *British Journal of Nutrition* 78, 237–249.[CrossRef](http://dx.doi.org/10.1079/BJN19970143) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Influence+of+foliage+from+African+multipurpose+trees+on+activity+of+rumen+protozoa+and+bacteria&publication+year=1997&author=Newbold+CJ&author=El+Hassan+SM&author=Wang+J&author=Ortega+ME&author=Wallace+RJ&journal=British+Journal+of+Nutrition&volume=78&doi=10.1079/BJN19970143&pages=237-249) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9301414)

Newman, DJ,Cragg, GM, Snader, KM (2000) The influence of natural products upon drug discovery. *Natural Product Reports* 17, 215–234.[CrossRef](http://dx.doi.org/10.1039/a902202c) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=The+influence+of+natural+products+upon+drug+discovery&publication+year=2000&author=Newman+DJ&author=Cragg+GM&author=Snader+KM&journal=Natural+Product+Reports&volume=17&doi=10.1039/a902202c&pages=215-234) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10888010)

Ng, TB,Wong, CM,Li, WW, Yeung, HW (1986) Insulin-like molecules in Momordica charantia seeds. *Journal of Ethno-pharmacology* 15, 107–117.[CrossRef](http://dx.doi.org/10.1016/0378-8741%2886%2990106-6%22%20%5Ct%20%22_blank) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Insulin-like+molecules+in+Momordica+charantia+seeds&publication+year=1986&author=Ng+TB&author=Wong+CM&author=Li+WW&author=Yeung+HW&journal=Journal+of+Ethno-pharmacology&volume=15&doi=10.1016/0378-8741(86)90106-6&pages=107-117) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/3520153)

Perez, RM,Ramirez, E, Vargas, R (2001) Effect of Cirsium pascuarense on blood glucose levels of normoglycaemic and alloxan-diabetic mice. *Phytotherapy Research* 15, 552–554.[CrossRef](http://dx.doi.org/10.1002/ptr.882) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Effect+of+Cirsium+pascuarense+on+blood+glucose+levels+of+normoglycaemic+and+alloxan-diabetic+mice&publication+year=2001&author=Perez+RM&author=Ramirez+E&author=Vargas+R&journal=Phytotherapy+Research&volume=15&doi=10.1002/ptr.882&pages=552-554)

Perry, NSL,Houghton, PJ,Theobald, A,Jenner, P, Perry, EK (2000) In vitro inhibition of human erythrocyte acetylcholinesterase by Salvia lavandulaefolia essential oil and constituent terpenes. *Journal of Pharmacy and Pharmacology* 52, 895–902.[CrossRef](http://dx.doi.org/10.1211/0022357001774598) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=In+vitro+inhibition+of+human+erythrocyte+acetylcholinesterase+by+Salvia+lavandulaefolia+essential+oil+and+constituent+terpenes&publication+year=2000&author=Perry+NSL&author=Houghton+PJ&author=Theobald+A&author=Jenner+P&author=Perry+EK&journal=Journal+of+Pharmacy+and+Pharmacology&volume=52&doi=10.1211/0022357001774598&pages=895-902) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10933142)

Roberfroid, MB (1999) Concepts in functional foods: The case of inulin and oligofructose. *Journal of Nutrition* 129 1398S – 1401S.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Concepts+in+functional+foods:+The+case+of+inulin+and+oligofructose&publication+year=1999&author=Roberfroid+MB&journal=Journal+of+Nutrition&volume=129" \t "_blank) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10395606)

Roth, GN,Chandra, A, Nair, MG (1998) Novel bioactivities of Curcuma longa constituents. *Journal of Natural Products* 61, 542–545.[CrossRef](http://dx.doi.org/10.1021/np970459f) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Novel+bioactivities+of+Curcuma+longa+constituents&publication+year=1998&author=Roth+GN&author=Chandra+A&author=Nair+MG&journal=Journal+of+Natural+Products&volume=61&doi=10.1021/np970459f&pages=542-545) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9584408)

Saucier, L (1999) Meat safety: challenges for the future. *Outlook on Agriculture* 28, 77–82.[CrossRef](http://dx.doi.org/10.1177/003072709902800204) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Meat+safety:+challenges+for+the+future&publication+year=1999&author=Saucier+L&journal=Outlook+on+Agriculture&volume=28&doi=10.1177/003072709902800204&pages=77-82)

Schmidely, P (1993) Quantitative review on the use of anabolic hormones with steroidal activity in ruminants reared for meat production. 2. Modes of action. *Reproduction Nutrition Development* 33, 297–323.[CrossRef](http://dx.doi.org/10.1051/rnd%3A19930401) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Quantitative+review+on+the+use+of+anabolic+hormones+with+steroidal+activity+in+ruminants+reared+for+meat+production.+2.+Modes+of+action&publication+year=1993&author=Schmidely+P&journal=Reproduction+Nutrition+Development&volume=33&doi=10.1051/rnd:19930401&pages=297-323)

Shu, YZ (1998) Recent natural products based drug development: a pharmaceutical industry perspective. *Journal of Natural Products* 61, 1053–1071.[CrossRef](http://dx.doi.org/10.1021/np9800102) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Recent+natural+products+based+drug+development:+a+pharmaceutical+industry+perspective&publication+year=1998&author=Shu+YZ&journal=Journal+of+Natural+Products&volume=61&doi=10.1021/np9800102&pages=1053-1071) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9722499)

Smith-Palmer, A,Stewart, J, Fyfe, L (1998) Antimicrobial properties of plant essential oils and essences against five important food-borne pathogens. *Letters in Applied Microbiology* 26, 118–122.[CrossRef](http://dx.doi.org/10.1046/j.1472-765X.1998.00303.x) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Antimicrobial+properties+of+plant+essential+oils+and+essences+against+five+important+food-borne+pathogens&publication+year=1998&author=Smith-Palmer+A&author=Stewart+J&author=Fyfe+L&journal=Letters+in+Applied+Microbiology&volume=26&doi=10.1046/j.1472-765X.1998.00303.x&pages=118-122) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/9569693)

Stewart, CS, Bryant, MP (1988) The rumen bacteria.In *The Rumen Microbial Ecosystem* 21–75 [Hobson, PN, editor]. London and New York: Elsevier Applied Science.[Google Scholar](https://scholar.google.com/scholar_lookup?title=The+Rumen+Microbial+Ecosystem&publication+year=1988&author=Stewart+CS&author=Bryant+MP&author=Hobson+PN&pages=21-75)

Teferedegne, B,Mclntosh, F,Osuji, PO,Odenyo, A,Wallace, RJ, Newbold, CJ (1999) Influence of foliage from different accessions of the sub-tropical leguminous tree, Sesbania sesban, on ruminal protozoa in Ethiopian and Scottish sheep. *Animal Feed Science and Technology* 78, 11–20.[CrossRef](http://dx.doi.org/10.1016/S0377-8401%2898%2900272-7) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Influence+of+foliage+from+different+accessions+of+the+sub-tropical+leguminous+tree+Sesbania+sesban+on+ruminal+protozoa+in+Ethiopian+and+Scottish+sheep&publication+year=1999&author=Teferedegne+B&author=Mclntosh+F&author=Osuji+PO&author=Odenyo+A&author=Wallace+RJ&author=Newbold+CJ&journal=Animal+Feed+Science+and+Technology&volume=78&doi=10.1016/S0377-8401(98)00272-7&pages=11-20)

Tyler, VE (1999) Phytomedicines: back to the future. *Journal of Natural Products* 62, 1589–1592.[CrossRef](http://dx.doi.org/10.1021/np9904049) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Phytomedicines:+back+to+the+future&publication+year=1999&author=Tyler+VE&journal=Journal+of+Natural+Products&volume=62&doi=10.1021/np9904049&pages=1589-1592) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10579884)

Ultee, A,Kets, EPW, Smid, EJ (1999) Mechanisms of action of carvacrol on the food-borne pathogen. *Bacillus cereus. Applied and Environmental Microbiology* 65, 4606–4610.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Mechanisms+of+action+of+carvacrol+on+the+food-borne+pathogen&publication+year=1999&author=Ultee+A&author=Kets+EPW&author=Smid+EJ&journal=Bacillus+cereus.+Applied+and+Environmental+Microbiology&volume=65&pages=4606-4610" \t "_blank) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10508096)

Van Nevel, CJ, Demeyer, DI (1988) *Manipulation of rumen fermentation The Rumen Microbial Ecosystem* 387–443[Hobson, PN, editor]. London and New York: Elsevier Applied Science.[Google Scholar](https://scholar.google.com/scholar_lookup?title=Manipulation+of+rumen+fermentation+The+Rumen+Microbial+Ecosystem&publication+year=1988&author=Van+Nevel+CJ&author=Demeyer+DI&author=Hobson+PN&pages=387-443)

Wallace, RJ, McPherson, CA (1987) Factors affecting the rate of breakdown of bacterial protein in rumen fluid. *British Journal of Nutrition* 58, 313–323.[CrossRef](http://dx.doi.org/10.1079/BJN19870098) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Factors+affecting+the+rate+of+breakdown+of+bacterial+protein+in+rumen+fluid&publication+year=1987&author=Wallace+RJ&author=McPherson+CA&journal=British+Journal+of+Nutrition&volume=58&doi=10.1079/BJN19870098&pages=313-323) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/3118940)

Wang, HX, Ng, TB (1999) Natural products with hypoglycemic, hypotensive, hypocholesterolemic, antiatherosclerotic and antithrombotic activities. *Life Sciences* 65, 2663–2677.[CrossRef](http://dx.doi.org/10.1016/S0024-3205%2899%2900253-2) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Natural+products+with+hypoglycemic+hypotensive+hypocholesterolemic+antiatherosclerotic+and+antithrombotic+activities&publication+year=1999&author=Wang+HX&author=Ng+TB&journal=Life+Sciences&volume=65&doi=10.1016/S0024-3205(99)00253-2&pages=2663-2677) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10622276)

Wiseman, H (1999) The bioavailability of non-nutrient plant factors: dietary flavonoids and phyto-oestrogens. *Proceedings of the Nutrition Society* 58, 139–146.[CrossRef](http://dx.doi.org/10.1079/PNS19990019) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=The+bioavailability+of+non-nutrient+plant+factors:+dietary+flavonoids+and+phyto-oestrogens&publication+year=1999&author=Wiseman+H&journal=Proceedings+of+the+Nutrition+Society&volume=58&doi=10.1079/PNS19990019&pages=139-146) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/10343351)

Wong, CM,Ng, TB, Yeung, HW (1985) Screening of Trichosanthes kirilowii, Momordica charantia and Cucurbita maxima (Family Cucurbitaceae) for compounds with anti-lipolytic activity. *Journal of Ethnopharmacology* 13, 313–321.[CrossRef](http://dx.doi.org/10.1016/0378-8741%2885%2990077-7) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Screening+of+Trichosanthes+kirilowii+Momordica+charantia+and+Cucurbita+maxima+(Family+Cucurbitaceae)+for+compounds+with+anti-lipolytic+activity&publication+year=1985&author=Wong+CM&author=Ng+TB&author=Yeung+HW&journal=Journal+of+Ethnopharmacology&volume=13&doi=10.1016/0378-8741(85)90077-7&pages=313-321)

Youn, HJ, Noh, JW (2001) Screening of the anticoccidial effects of herb extracts against Eimeria tenella. *Veterinary Parasitology* 96, 257–263.[CrossRef](http://dx.doi.org/10.1016/S0304-4017%2801%2900385-5) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Screening+of+the+anticoccidial+effects+of+herb+extracts+against+Eimeria+tenella&publication+year=2001&author=Youn+HJ&author=Noh+JW&journal=Veterinary+Parasitology&volume=96&doi=10.1016/S0304-4017(01)00385-5&pages=257-263) | [PubMed](https://www.ncbi.nlm.nih.gov/pubmed/11267752)

Zaika, LL & Kissinger, JC (1981) Inhibitory and stimulatory effects of oregano on Lactobacillus plantarum and Pediococcus cerevisiae. *Journal of Food Science* 46, 1205–1210.[CrossRef](http://dx.doi.org/10.1111/j.1365-2621.1981.tb03024.x) | [Google Scholar](https://scholar.google.com/scholar_lookup?title=Inhibitory+and+stimulatory+effects+of+oregano+on+Lactobacillus+plantarum+and+Pediococcus+cerevisiae&publication+year=1981&author=Zaika+LL&author=Kissinger+JC&journal=Journal+of+Food+Science&volume=46&doi=10.1111/j.1365-2621.1981.tb03024.x&pages=1205-1210)

Keywords

* [Plant secondary metabolites](https://www.cambridge.org/core/search?filters%5bkeywords%5d=plant%20secondary%20metabolites)
* [Essential oils](https://www.cambridge.org/core/search?filters%5bkeywords%5d=essential%20oils)
* [Rumen](https://www.cambridge.org/core/search?filters%5bkeywords%5d=rumen)
* [Metabolism](https://www.cambridge.org/core/search?filters%5bkeywords%5d=metabolism)
* [Delivery system](https://www.cambridge.org/core/search?filters%5bkeywords%5d=delivery%20system)
* [Librarians](https://www.cambridge.org/core/services/librarians)
* [Authors](https://www.cambridge.org/core/services/authors)
* [Publishing partners](https://www.cambridge.org/core/services/publishing-partners)
* [Agents](https://www.cambridge.org/core/services/agents)
* [Corporates](https://www.cambridge.org/core/services/corporates)
* [Additional Information](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553#additional)
* [Legal Information](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553#legal)
* [© Cambridge University Press 2020](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)
* [Back to top](https://www.cambridge.org/core/journals/proceedings-of-the-nutrition-society/article/plants-and-plant-extracts-for-improving-animal-productivity/1648950644BA944921DB0C6A42FCD553)