Lupin processing: a new development

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For a number of years Grain Pool marketing representatives have approached stockfeed manufacturers around the world in an attempt to broaden the market for Western Australian lupin seed.

Wherever there was enough consumer interest to conduct a nutritional evaluation of the product, lupins were found to be non-competitive for inclusion in both pig and poultry rations, while at the same price being acceptable as a cattle feed ingredient. The reason for this disparity proved to be the varying degrees of fibre digestibility of lupins for the various livestock types tested.

It became apparent that the fibrous lupin seed coat or hull was the difference between West

Australian lupin seed penetrating the world’s pig and poultry markets or being restricted to lupin exports for ruminants only. The only way in which the Grain Pool could be competitive with other protein sources was to supply dehulled lupins or lupin kernels.

Having identified the demand for dehulled lupins, the next task was to find a use for the by-product, the lupin hull. The lupin hull represents about one-quarter of the whole seed and if the hulls were simply discarded, the premium required for the kernels would price it out of most or all markets, bearing in mind that dehulling costs must also be included.

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This result in turn proved to be the catalyst for a solution to the problem of finding a viable use for lupin hulls.

Based on crude protein levels of about 4 per cent for pure hull material and 40 per cent for pure kernel, I calculated that a mixture of 75 per cent hull and 25 per cent kernel would achieve a composite protein level of 12 to 13 per cent. By using all the hull material available from each seed, about 23 per cent, and by re-including about 7 per cent of the whole seed in the form of kernel, this 30 per cent portion of a whole seed produced the same 12 to 13 per cent protein level. This then released 70 per cent of the original seed as pure kernel, the product that the Grain Pool wished to supply.

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Feeding trials

In the meantime, trials had started at the University of Western Australia on the feeding of whole lupin seed to export wethers as an alternative to the traditional sheep pellets. This work, supervised by Dr J. B. Makintosh and with a grant from the Western Australian Grain Research Committee, found that this high protein lupin diet resulted in excessive levels of ammonia being discharged from sheep.

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This theoretical process was tested in March 1985 and the calculations proved correct. The hull plus kernel by-product was pelleted and the pellets proved extremely durable, being able to withstand the type of handling involved in the live sheep shipping trade. A small batch of 120 kg of pellets was made and passed on to Dr Makintosh for digestibility testing with sheep. The results showed that the energy value of the lupin pellet was comparable with the energy value found in commercially produced live sheep export rations.

Based on these results larger feeding trials started, again supervised by Dr Makintosh. Lupin pellets and a batch of conventional pellets were fed to 100 shipping wethers in four pens of 25 sheep. At the end of the five-week trial sheep fed the lupin pellets had performed better than those fed the commercial rations. The sheep quickly adapted from grazing pasture to the lupin pellets, thus highlighting their palatability in relation to conventional pellets.

At the same time handling and storage trials for the kernels and the pellets were in progress, as were programmes to accurately establish the feeding value of lupin kernels for pigs and poultry.

The handling trials for both kernels and pellets, conducted with the assistance of Co-operative Bulk Handling's North Fremantle personnel and facilities, detected no significant handling problems.

At the Department of Agriculture, South Perth, Mr D. Petterson co-ordinated storage trials on lupin kernels. They included the kernel's susceptibility to fungal and insect attack and potential for rancidity. All the results were favourable, with the kernel oil being particularly stable.

At the Department of Agriculture's Intensive Industries Research Centre in Medina, lupin kernel feeding trials have started with pigs and poultry. The pig trials are supervised by Mr N. Godfrey and the poultry trials by Mr P. O'Malley. One group of pig feeding trials using a soybean meal-based ration as a comparison has been completed. The results show that lupin kernels have a significantly better feeding value than crushed whole lupins. Early expectations are that the poultry trials will give similar results when they are finished.

Market prospects

Market prospects for lupin kernels include both the domestic and overseas pig and poultry industries, particularly in South-East Asia and the Far East. This market has an enormous growth potential for lupin kernels for its livestock industries and is one that will not overlap with current or prospective whole lupin seed markets. It is also possible, in the longer term, that lupin kernels could be substituted for soybeans in vegetable-based human food products, again particularly throughout Asia.

The lupin pellets have several prospective markets. As the lupin pellets can be made to order, they can be fed to different types and ages of ruminants simply by regulating the amount of kernel that is re-included in the mixture. A maintenance ration for adult sheep for example would need far less kernel in the pellet than would the higher protein ration needed by a lactating dairy cow. Protein, energy and fibre levels can be readily regulated during production of the pellets. This flexibility of composition of hulls plus kernel by-product should prove extremely popular for sales within Australia and overseas.

Given the information we now have about the qualities of the lupin hull and the kernel, we are confident about the imminent development of a lupin processing industry in Western Australia.