6.0 PART 3: CONSUMER RESEARCH STUDY

This study involved further development of the lupin soup as produced in part 2. The developed product was used in conjunction with an attitudinal study to investigate consumers acceptance of the soup and their attitudes towards the use of lupin as a food ingredient.

6.1 LOCATION

The Midland Gate shopping centre was chosen as the location for surveying as they were conducting a Grains Expo which attracted a number of shoppers. A display was set up to attract shoppers to the soup tasting section of the Expo (see appendix G).

6.2 SUBJECTS

The subjects were a non-probability based sample of shoppers from Midland Gate shopping centre. This shopping centre services a mixed population of socio-economic groups, including a large proportion of shoppers from rural areas.

6.3 TEST INSTRUMENT

A questionnaire was designed to provide sensory and attitudinal data on the use of lupin as a human food.

The instrument was pilot-tested and assessed by an expert in the area of scaling and measurement.
6.4 MARKET SURVEY QUESTIONNAIRE

Number
Age (est) __________
Gender M/F

Where were you raised?
City / Country

1. Would you please try these two soups and tell me which one you prefer?
   + or v

2. If I told you that this soup contained soy (lupin) beans, how likely would you be to buy it?

<table>
<thead>
<tr>
<th>Would not buy at all</th>
<th>Definitely would buy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample +</td>
<td></td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
<tr>
<td>Sample v</td>
<td></td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
</tbody>
</table>

3. Many foods on the market contain added ingredients such as soy and lupin beans. How do you feel about these food containing soy or lupin beans?

<table>
<thead>
<tr>
<th>Much less likely to try</th>
<th>Much more likely to try</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SOYBEAN</th>
<th>LUPIN</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAMBURGER</td>
<td></td>
</tr>
<tr>
<td>MILK</td>
<td></td>
</tr>
<tr>
<td>SOUP</td>
<td></td>
</tr>
<tr>
<td>PASTA</td>
<td></td>
</tr>
</tbody>
</table>

4. In your opinion, what is the effect of adding soy or lupin to a food product in terms of .... (card)

<table>
<thead>
<tr>
<th>Much worse</th>
<th>Much better</th>
</tr>
</thead>
<tbody>
<tr>
<td>TASTE:</td>
<td></td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
<tr>
<td>NUTRITION:</td>
<td></td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
<tr>
<td>COST:</td>
<td></td>
</tr>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
</tbody>
</table>

5. Did you know that lupins are high in protein and fibre, low in fat and have cholesterol lowering properties? YES/NO

6. To what extent would you be likely to buy foods containing lupins now that you know more about their health value?

<table>
<thead>
<tr>
<th>No change</th>
<th>Much more likely to buy</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6 7 8 9</td>
<td></td>
</tr>
</tbody>
</table>

7. Had you heard of lupins before today? YES / NO / NOT SURE
   If yes, do you remember where you first heard of them?
   Comments

8. What do you think of the name lupin? POS / NEG / NONE
   Comments

9. Is lupin a good name for a food product? POS / NEG / NONE
   Comments
6.5 DESIGN

The study involved asking respondents to sample the developed soup product (without being informed of its ingredients) then requesting them to respond to a series of questions asked by the interviewer. A number of interviewers were employed to conduct the interviews.

6.6 DATA ANALYSIS

Quantitative data were statistically analysed using the Minitab statistical package.

Qualitative data were pre-coded where possible prior to conducting the interviews to allow responses to be directly comparable.

The results were reported in a standard written format. Tables and graphs were used where necessary.
6.7 RESULTS OF THE MIDLAND GATE MARKET SURVEY

6.7.1 DEMOGRAPHIC DETAILS

There were 524 respondents sampled from Midland Gate shopping centre. The respondents sampled were mostly in the older age bracket (see Figure 18). The average age of respondents was 47 years.

Figure 18. Age distribution of respondents
More females (65%) than males (35%) were interviewed, this is likely to be because more females do the household weekday shopping than males. There was no marked difference between male and female responses to any of the questions asked. A relatively even distribution of respondents raised in the city (46%) and country (49%) were represented in the sample (see Figure 19). There was also no marked difference between responses of those respondents raised in the city and country to any of the question asked.

Figure 19. Demographic details of respondents
In question one, respondents were asked to try the two unidentified soups marked + and v, and state which soup they preferred. If respondents asked about the soups they were informed that they were vegetable based soups with some legumes added and that there was no animal content.

The lupin soup (58%) was markedly preferred over the soybean soup (35%). It appears that respondents found the taste of lupin soup acceptable, even though they were unfamiliar with the taste of lupins (see Figure 20). It
seems that in terms of sensory characteristics alone, the addition of lupin kernel actually is superior to the effects of adding the same amount of soybean kernel.

6.7.3 LIKELIHOOD OF BUYING THE SOUPS

In question two the respondents were then told that the soup marked + contained lupins and the sample marked v contained soybeans. Respondents were then asked to indicate if they would be likely to buy either of the soups if they were on the market at a reasonable price. Responses were indicated by rating the soups on a scale of 1 (would not buy at all) to 9 (definitely would buy).

**SAMPLE + LUPIN SOUP**

<table>
<thead>
<tr>
<th>WOULD NOT BUY AT ALL</th>
<th>DEFINITELY WOULD BUY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>6 7* 8 9</td>
</tr>
</tbody>
</table>

**SAMPLE v SOYBEAN SOUP**

<table>
<thead>
<tr>
<th>WOULD NOT BUY AT ALL</th>
<th>DEFINITELY WOULD BUY</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5</td>
<td>6 *7 8 9</td>
</tr>
</tbody>
</table>

*Figure 21. Likelihood of buying lupin and soybean soup (* Mean score)*

**RESULTS**

The average response for the lupin soup was 7.1 and 6.8 for the soybean soup (see Figure 21). The results were very similar for both soups. The results were on the high end of the scale indicating that consumers would be likely to buy either of the soups if they were on the market at a reasonable price. It appears that respondents found the
lupin soup to be at least as acceptable as the soybean soup even when told the soup contained lupin.

6.7.4 ACCEPTANCE OF OTHER FOODS THAT MAY CONTAIN SOYBEAN OR LUPIN

Question three involved asking respondents if they would try hamburgers, milk, soup and pasta, if they knew they contained soybean or lupin as an ingredient. Hamburgers and milk are foods already on the market which frequently contain soybean, while soup and pasta are foods that do not generally contain soybean. Respondents were asked to rate their responses on a scale of 1 (would not try at all) to 9 (definitely would try).

Figure 22. Acceptance of other foods containing lupin and soybean
RESULTS

Respondents rated hamburgers, pasta and soup on the higher end of the scale (see Figure 22). The soup (lupin 7.3 and soybean 7.0) and the pasta (lupin 6.7 and soybean 6.7) were the foods that respondents would most likely try. They were less likely to try the hamburgers (lupin 5.9 and soybean 5.9) or the milks (lupin 5.1 and soybean 4.9).

All the foods containing lupin were rated similarly to the foods containing soybean. This indicates that lupin is at least as acceptable as soybean as a food ingredient. The respondents attitudes towards lupin appears to indicate that they found lupin acceptable in the developed lupin soup when they tried it, and therefore they feel it would be acceptable in other developed food products, especially pasta. This suggests that lupin could be incorporated in other foods as a known ingredient and that there is no need to disguise its presence.

6.7.5 THE EFFECT OF LUPIN ON TASTE, NUTRITION AND COST

Question four involved asking respondents what they felt the effect of adding lupin to foods would have on the taste, nutrition and cost of a food product.

It was expected that respondents would feel that lupins would make a food product taste worse as they are unfamiliar with the use of lupin in foods for human consumption. In terms of nutrition, it was expected that respondents would feel that lupins will make a product more nutritious as legumes and grains are generally associated with good
health. It was also expected that respondents would feel that lupin will make a food product more expensive (much worse) as consumers usually perceive a new food product as adding cost to a food item.

Respondents were asked to rate their answers on a scale of 1 (much worse) to 9 (much better).

**TASTE**

<table>
<thead>
<tr>
<th>MUCH WORSE</th>
<th>MUCH BETTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6</td>
<td>*7 8 9</td>
</tr>
</tbody>
</table>

**NUTRITION**

<table>
<thead>
<tr>
<th>MUCH WORSE</th>
<th>MUCH BETTER</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6</td>
<td>7* 8 9</td>
</tr>
</tbody>
</table>

**COST**

<table>
<thead>
<tr>
<th>MUCH WORSE (Dearer)</th>
<th>MUCH BETTER (Cheaper)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 2 3 4 5 6</td>
<td>7 8 9</td>
</tr>
</tbody>
</table>

*Figure 23. Effect of lupin on taste, nutrition and cost (* Mean score)*
RESULTS

The responses were very positive in that most respondents rated lupin highly on all questions. The average response for the effect of lupin on taste was 6.8, on nutrition 7.3 and on cost 6 (see Figure 23). It appears that respondents felt that adding lupin to a food product would make it tastier, more nutritious and cost slightly less. These results indicate that the addition of lupin to foods is likely to be seen as positive by consumers.

6.7.6 KNOWLEDGE OF NUTRITIONAL PROPERTIES OF LUPIN

Question five involved asking respondents if they were aware of the health properties of lupins: that lupins are high in protein and fibre and low in fat and have cholesterol-lowering properties. It was expected that very few, if any, respondents would be aware of the health value of lupins, especially because very little published work has been completed on the cholesterol-lowering properties of lupins (Evans et al., 1990).

RESULTS

Results showed that 41% of respondents said that they were aware of the nutritional properties of lupins. This result is questionable. It is likely that some respondents were aware of some of the nutritional properties of lupins due to their associations with lupins on the farms, however
very few, if any respondents would have been aware of the cholesterol-lowering properties. It is also possible that some respondents just answered yes to the question to appear knowledgeable.

6.7.7 EFFECT OF HEALTH VALUE ON ATTITUDES TOWARD LUPINS

In question six, respondents were asked if the health value of lupins, as stated in question five, would influence them when buying a food that had lupin as an ingredient. It was expected that an awareness of the health value of lupins would increase the likelihood of respondents buying a food product which contained lupin, due to the increasing consumer awareness of the importance of good nutrition.

The respondents were asked to rate their answers on a scale on 1 (no change) to 9 (more likely to buy).

<table>
<thead>
<tr>
<th>No Change</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Much more likely to buy</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
</table>

Figure 24. Effect of lupins nutritional properties on consumers' buying behaviour
(* Mean score)
RESULTS

The average response 7.6, was on the high end on the scale (see Figure 24). It appears that the stated nutritional properties of lupin would certainly encourage consumers to buy a product containing lupin, and that the health value of lupins could be used as a marketing tool when promoting lupins.

6.7.8 AWARENESS OF THE NAME LUPIN

Question seven asked respondents if they had heard of lupins before, and if so where. It is expected that a lot of West Australians would have heard of lupins as they are a significant primary product in Western Australia being second only to wheat in terms of acreage and crop value.

![Bar chart showing awareness of lupin and positive attitudes towards the name lupin]

Figure 25. Whether respondents had heard of lupin and their attitude towards the name lupin.
Table 30

Where Respondents had Heard of the Name Lupin

WHERE THEY HEARD OF LUPINS NO. OF RESPONDENTS

<table>
<thead>
<tr>
<th>WHERE THEY HEARD OF LUPINS</th>
<th>NO. OF RESPONDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seen growing on Farms</td>
<td>138</td>
</tr>
<tr>
<td>As Animal Feed</td>
<td>57</td>
</tr>
<tr>
<td>Lupins Grower</td>
<td>47</td>
</tr>
<tr>
<td>Promotion Activities</td>
<td>33</td>
</tr>
<tr>
<td>Seen the Flower</td>
<td>21</td>
</tr>
<tr>
<td>Grow at Home</td>
<td>14</td>
</tr>
<tr>
<td>Plant puts nitrogen into soil</td>
<td>14</td>
</tr>
<tr>
<td>Country Women's Association</td>
<td>9</td>
</tr>
<tr>
<td>Other Countries (Italy, N.Z., Africa)</td>
<td>9</td>
</tr>
<tr>
<td>Weed</td>
<td>1</td>
</tr>
</tbody>
</table>

RESULTS

The majority of respondents (85%) had heard of lupins before. Most had seen lupins growing in the country or been involved in growing them (see Table 30 and Figure 25).

6.7.9 ATTITUDES TOWARD THE NAME LUPIN

Respondents were asked two questions (eight and nine) about the name lupin. Firstly they were asked if they thought the name was positive or negative and secondly, asked if they thought the name lupin was positive or negative for a food product. It was expected that many respondents may feel the name lupin is negative due to its traditional association with animal feed.

Respondents were also asked to suggest a suitable alternative name for lupins if possible.
Table 31
Why Respondents Felt the Name Lupin was Positive or Negative

<table>
<thead>
<tr>
<th>NEGATIVE</th>
<th>Number</th>
<th>POSITIVE</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Animal Feed</td>
<td>26</td>
<td>Good for animals</td>
<td>16</td>
</tr>
<tr>
<td>Weed</td>
<td>5</td>
<td>Common name</td>
<td>4</td>
</tr>
<tr>
<td>Doesn't sound like a food</td>
<td>4</td>
<td>Good for soil</td>
<td>3</td>
</tr>
<tr>
<td>Flower not a food</td>
<td>4</td>
<td>Easy to remember</td>
<td>2</td>
</tr>
<tr>
<td>Disease</td>
<td>3</td>
<td>Beautiful plant</td>
<td>1</td>
</tr>
<tr>
<td>Not use to it</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>City folk wouldn't like</td>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sounds Asian</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sounds French</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sounds like a bug</td>
<td>1</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RESULTS

The name lupin was seen as slightly more positive (59%) than negative (19%), with many respondents neutral. This result supported findings by Zweck (1988, p. 21) who also found that 59% of respondents thought the name lupin was positive.

Those respondents who did comment on why they thought it was negative, said so because of its association with animal feed. Those that thought it was positive believed if lupins were good enough for animals, they were good enough for humans too; or if an animal will eat them they must be good.

The name lupin was seen as more positive for a food product (71%) than negative (22%). This is a very favourable result and appears to indicate that the name lupin is a suitable name for a food ingredient. This result differs from Zweck (1988, p. 21) who found that only 49% of respondents thought the name lupin was positive for a food
product. This suggests that consumers attitudes towards lupin may have changed as lupins have become more well known.

Very few respondents suggested an alternative name for lupin. Table 32 shows those name which were suggested and some comments on what the name should be like.

<table>
<thead>
<tr>
<th>Table 32 Alternative Names For Lupin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nipul (lupin backwards)</td>
</tr>
<tr>
<td>Loopy</td>
</tr>
<tr>
<td>Lupini</td>
</tr>
<tr>
<td>Lupino</td>
</tr>
<tr>
<td>Lupea</td>
</tr>
<tr>
<td>Lupinosis</td>
</tr>
<tr>
<td>Ground beans</td>
</tr>
</tbody>
</table>

**COMMENTS:**
- Pea name
- Healthy name
- Name with lupin in it
- Something catchy
6.8 SUMMARY

The results of the Midland Gate Market Survey were very positive. Respondents indicated a marked preference for the lupin soup and that they would be just as likely to buy the lupin soup if it was on the market as they would a soybean soup. This is a very favourable result as respondents would not be as familiar with the taste of lupin, yet they did not appear to find it unacceptable.

Respondents indicated that they would not only try the lupin soup, but that they would at least be as likely to try other foods such as hamburgers, milk and pasta if they contained lupin, as they would if they contained soybean.

It was also generally felt that the effect of lupin as a food ingredient would be to make the food product taste better, more nutritious and cost less.

Some respondents indicated they were aware of the health value of lupins: that they are high in protein and fibre, low in fat and have cholesterol-lowering properties. Although this result is questionable (as few people are aware of lupins cholesterol-lowering properties) the results indicate if respondents were aware of lupins health value they would be more likely to buy a food product that contained lupin.

Most respondents had heard of lupins before, mainly by seeing them growing on farms or from being involved in
growing lupins. Respondents were reasonably evenly weighted in terms of whether they thought the name lupin had positive or negative connotations. Those respondents who did comment on why they felt the name lupin was negative stated it was because of the association of lupin to animal feed. However, the association of lupin to animals was also seen by some respondents as positive. They felt that if animals would eat lupins and if lupins were good for animals then lupins must be suitable for humans.

The name lupin was perceived as being more positive as a name for a food ingredient. It seems that there is no real risk in making known the inclusion of lupin in any food product.

It could be concluded that it would be acceptable to use the name lupin for a food ingredient used for human consumption as respondents’ attitudes toward lupin are generally positive. It also appears that it would be acceptable to state that a food product contained lupin, as respondents felt incorporating lupin would improve the taste, nutritional value and lower the cost of a food product. When promoting lupins the health value of lupins could be used as a positive marketing strategy.
The results of this study show that an acceptable food can be made using lupin kernel as a significant ingredient. The lupin kernel soup which was developed through the use of sensory evaluation techniques was judged to be, in sensory terms, more acceptable than a vegetable soup incorporating a similar amount of soybean kernel.

The preference for the lupin soup also applied when the consumers were told of the presence of lupin in the soup. The results of the Consumer Research component of the study, clearly suggest that many consumers felt that the incorporation of lupin would be likely to make a food tastier and more nutritious.

A marketing message which stated that lupin had certain potential health benefits such as cholesterol-lowering properties, was found to be likely to have a positive effect on buying potential.

Generally the attitudes of consumers were positive towards the use of lupin as a food ingredient with little evidence of consumer resistance. The known association of lupin with animal food did not have any discernible negative effects on consumer attitudes. These results applied to both city and country raised consumers and were independent of the gender of respondents.

As well as showing that a satisfactory food can be developed using lupin as an ingredient, the study also
included a detailed analysis of the biochemical changes which occurred during the germination of lupin sprouts.

It was clear from the results that there were marked biochemical changes taking place during the 6 days of germination.

The early stages of germination, including the initial soaking of the kernel, produced a number of changes which indicated increases in protein and polysaccharides and a reduction in fat and the antinutrients, oligosaccharides and alkaloids.

Evidence relating to biochemical changes occurring during the later stages of germination was less clear due to technical problems experienced with the use of automatic sprouting equipment. The commercial Micro Malter apparatus is usually used for the sprouting of barley and a lack of experience with its use for lupin resulted in the production of a sprout which was affected by moisture stress.

This is believed to have altered the quality of the developed sprout and therefore influenced the results of both the biochemical assays and an attempt to conduct a sensory analysis of the effects of the biochemical changes which take place during germination.

It would be seen from these findings that there is a considerable value in conducting biochemical assays on good quality sprouts which have been germinated under commercial growing conditions rather than by using more laboratory centred techniques. This would assist in transferring data.
gathered directly to the process of commercial food production.

Similarly there seems to be virtue in persevering with the attempt to identify the sensory effects of the biochemical changes taking place during germination. There does not appear to have been a serious attempt to do this previously and if successful this approach would add greatly to the pool of scientific data about the effects of germinating legumes. It could also help developing food products using both lupin kernel and lupin sprout.

The results of this study would appear to add to existing knowledge in the area and could well lead to the development of foods suitable for incorporation both in Australia and in off-shore markets.
8.0 REFERENCES


