Kasetsart J. (Nat. Sci.) 36 : 426 - 434 (2002)

Suitability of Using Herbs as Functional Ingredients in Thai Commercial Snacks

Wiwat Wangcharoen[1], Tipvanna Ngarmsak[1] and Brian H. Wilkinson[2]

ABSTRACT

Forty-three Thai consumers were informed about the physical properties and medicinal uses of selected Thai herbs prior to asked to make a decision on which of 14 functional herbs could be used in 7 different types of Thai commercial snack foods. Thirty-eight New Zealanders evaluated the suitability of 8 Thai herbs together with other 8 herbs grown in New Zealand. The results of both Thai and New Zealand respondents showed that functional herbs could be added to prawn crackers, dried squid and dried fish snacks, puffed snacks and potato chips rather than nuts or popcorn. The suitable Thai herbs selected by Thais were pepper, holy basil and garlic. For New Zealanders, the suitable NZ herbs were chives and parsley, and the more suitable Thai herbs were garlic, lemon grass, pepper, and ginger.

Key words: Thai commercial snacks; Thai herbs; New Zealand herbs

INTRODUCTION

The health-promoting effect of foods is the food industry's big idea at the start of the 21st century. The future of food will increasingly be about how it affects consumer health and well-being and the sorts of products and ingredients that will deliver such health benefits (Heasman and Mellentin, 2001). Simultaneously, traditional meal patterns are being broken down. Lifestyles are becoming more hectic and consumers are less likely to spend time preparing and consuming meals affecting the inexorable rise of snacking patterns (Promar International, 1997). Unfortunately, snack foods have had to battle the junk food image for a long time due to their high fat and salt content. The drive toward a healthier diet has led many producers to look at alternative snack products that avoid high levels of fat, sugar and salts; are fortified with vitamins and minerals or even ingredients described as functional; or present fruit and vegetables in a snack format (Tuley, 2000).

Herbs have been added to foods throughout history for either preservation and/or flavour purposes. Creative use of herbs can make foods far more enjoyable to eat, no less healthy because they add negligible calories, and in many cases make food healthier because using herbs allow salt and fat to be removed because herbs are such effective flavouring agents (Dole Food Company, 2001). Moreover, the pharmacological properties of herbs have been documented recently by Thomas (2000) and Mazza and Oomah (2000).

Given the facts that herbs are such effective flavouring agents for snacks (Williams, 1999; Nordmark, 1999), and some of herbs have been used to possess pharmacological activity to these products (Pszczola, 1999). It might be possible to

1 Department of Food Technology, Faculty of Technology, Khon Kaen University, Khon Kaen 40002, Thailand.
2 Institute of Food, Nutrition, and Human Health, Massey University, Palmerston North, New Zealand.

produce a range of snacks that have a healthier image and possibly health improving properties by the judicious inclusion of some herbs that possess the nutraceutical activity along with other spices and flavouring agents.

Thailand's commercial snacks market was worth about Bt10 billion in 2000. Extruded snacks accounted for 35 per cent of this market, potato chips 31 per cent, dried fish snacks 11 per cent, prawn crackers 10 per cent, nuts 9 per cent, dried squid snacks 3 per cent, and popcorn 1 per cent (Thansettakij, 2001). The objective of this research was to ascertain which functional herbs could be incorporated into 7 commercial snack groups.

MATERIALS AND METHODS

(1) Respondent selection

A group of 40 consumers who ate snacks on a regular basis in Thailand and also Palmerston North, New Zealand, were asked to participate in this study. These respondents were classified into 4 age groups: 12-18, 18-22, 23-35, and over 35 year old, with the equal numbers of male and female in each age group. Therefore, 5 males and 5 females would be collected as respondents for each age group.

(2) Questionnaire and procedure

The questionnaire objected to determine which functional herbs could be combined with each of 7 snack categories with a view to improve the health promoting properties of each snack type. These snack types consisted of puffed snacks, potato chips, dried fish snacks, prawn crackers, nuts, dried squid, and popcorn. Sixty-one Thai herbs having primary health care properties (Hehmhongsha, 1998) were screened by using 3 criteria. Firstly, the herbs are used for the pharmacological care by consuming. Secondly, they possess at least 4 out of the 5 following medicinal aspects: minimize risks of cancer; prevent or relieve heart and vascular disease; prevent and relieve diabetes; prevent and relieve abdominal pains from ulcers, burps, etc; and finally improve the immune system. Finally, the herb should not be bitter or have a strong medicinal flavour. Herbs will be selected when meet all 3 criteria. Fourteen selected herbs are asiatic pennywort, cloves, galangal, garlic, ginger, holy basil, Indian laburnum, lalang grass, lemon grass, myrobalan, nut grass, pepper, roselle, and turmeric, and are used in questionnaire for Thai consumer. For New Zealander respondents who were unfamiliar to all Thai herbs, some of them in the list were replaced by pharmacologically active herbs available and known to New Zealanders. Therefore, the selected 8 Thai herbs in their questionnaires were asiatic pennywort, cloves, holy basil, garlic, ginger, lemon grass, pepper, and turmeric, and the selected 8 New Zealand herbs consisted of alfalfa, chives, echinacea, horseradish, parsley, red clover, rosemary, and thyme (Painter, 1995).

First, the respondents were informed about the properties of each selected herb with a photograph and a description of part used, flavour, and medicinal uses. Second, they were asked to taste 3 blind samples of one snack category and then they were requested to state their opinions about the suitability of using each herb in that product by using 9-point scales (1 = extremely unsuitable, 5 = neither suitable nor unsuitable, 9 = extremely suitable). There was 10-minute break before the samples of next category were served, but the break between the fourth and the fifth category was extended to 20 minutes.

(3) Data analysis

The analysis of variance by Randomized Completely Block Designs (RCBD) was used to indicate a significant difference exists and then the mean comparison was done by Duncan's multiple range test (Resurreccion, 1998) by SPSS version 10 (SPSS Inc., Chicago, IL). In addition, the perceptual maps of products and herbs were created by Principal Component Analysis (Neal, 1988) by Senstools version 2.3.28 (OP&P Product Research BV,

Utrecht, The Netherlands).

RESULTS AND DISCUSSION

The survey for Thai respondents was conducted in February 2001. In the field works, there were one more of male and female in 12-18 year old group and one more female in 23-35 year old group. Therefore, total amounts of Thai respondents were 43. For New Zealand respondents, the survey was conducted in October 2001. Two females in 19-22 group did not complete all of their questionnaires. Therefore, there were 38 complete responses for New Zealanders.

The results of both Thais and New Zealanders showed that prawn crackers, dried fish snacks, dried squid, puffed snacks, and potato chips were more suitable for herb seasoning than nuts and popcorn as shown in Table 1. The suitable Thai herbs from Thai respondents were pepper, holy basil, and garlic, followed by lemon grass, ginger, cloves and so on as shown in Figure 1. The suitable herbs from New Zealanders' statements were chives, parsley, lemon grass, and garlic, followed by pepper, ginger and so on as shown in Figure 2. Table 1 and Figures 1-2 show that Thai respondents tended to accept the herb in snack products rather than did New Zealanders (see lower suitability scores of New Zealand respondents). These might be reasoned by the more familiarity of using herbs as spices in Asia countries and many herbs are used as ingredients or condiments in Thai cuisine (Uhl, 2000) but only chives are used as a normal condiment for New Zealanders (Painter, 1995).

When the results for each product category of Thai responses were considered (Table 2). It was found that the compatible herbs which should be added in prawn crackers, dried fish snacks, dried squid, puffed snacks, and potato chips were pepper, garlic and holy basil, whilst the suitable herbs for popcorn were laburnum, asiatic pennywort, lemon grass, lalang grass, roselle, and turmeric. These results might be influenced by the flavour of each herb.

Form the literature review on the flavour of herbs, cloves, garlic, galangal, holy basil, pepper and nut grass are hot and pungent. Ginger is sweet, hot and pungent. Turmeric is astringent, sweet and aromatic. Lemon grass is aromatic. Roselle and myrobolan are sour. Asiatic pennywort and lalang grass are mild, and laburnum is sweet (Wuthithummawate, 1997; Phuthiyanun, 1999). It seemed that hot pungent flavoured Thai herbs should be added to prawn crackers, dried fish snacks, dried squid, puffed snacks, and potato chips which Thai people are familiar to their savoury flavoured. In the other hand, sweet, mild, sour or aromatic would be more suitable for popcorn which most products

Table 1 Mean of suitability scores of herb inclusion in each snack category.

	Mean of suitability scores	
	Thais	New Zealanders
Prawn crackers	6.13^{a}	5.69^{a}
Dried fish snacks	6.07^{a}	5.18^{bc}
Dried squid	6.08^{a}	4.98^{c}
Puffed snacks	6.05^{a}	5.23^{b}
Potato chips	5.97^{a}	5.69^{a}
Nuts	5.50^{b}	4.36^{d}
Popcorn	4.96^{c}	4.08^{e}

a, b,... are significantly different ($p \leq 0.05$) in each column.

are flavoured by butter, caramel, and chocolate.

For nuts, the compatible herbs were pepper, garlic, holy basil, lemon grass, and ginger but the range of suitability scores of all selected herbs were narrow when they were compared to the other products (see the column for score range of all selected herbs in Table 2). These showed the less difference of Thai consumer views on flavoured nuts with herbs since they could be either sweet or savoury. Especially peanut, the representative of nuts in this study, it is the best example of all-purpose nut that can be and has been treated in innumerable ways. For example, it can be salted and spiced, or sugared and spiced, or salted and sugared with or without spices, or flavoured with various materials such as smoke flavour and so on (Booth, 1990).

All Thai results may be more evidently if they are presented by a perceptual map in Figure 3. The suitability scores of 5 products and 9 herbs highly related to the horizontal axis (dimension 1). These 5 products were dried fish snacks, dried squid, puffed snacks, nuts, and popcorn, and these 9 herbs consisted of holy basil, garlic, pepper, cloves, ginger, galangal, lemon grass, asiatic pennywort, and Indian laburnum. The suitability scores of the rest 2 products and 5 herbs highly related to the vertical axis (dimension 2). The rest 2 products and 5 herbs were potato chips, prawn crackers, lalang grass, roselle, myrobalan, nut grass, and turmeric, respectively. Prawn crackers, dried fish snacks, dried squid, puffed snacks, and potato chips located on the positive side of horizontal axis whilst nuts and popcorn were on the opposite side but nuts seem to be in the middle between the first 5 products and popcorn. Simultaneously, prawn crackers located far from the other products in negative side of vertical axis. These positions showed the differences of compatible herbs to products in each direction of each axis. The

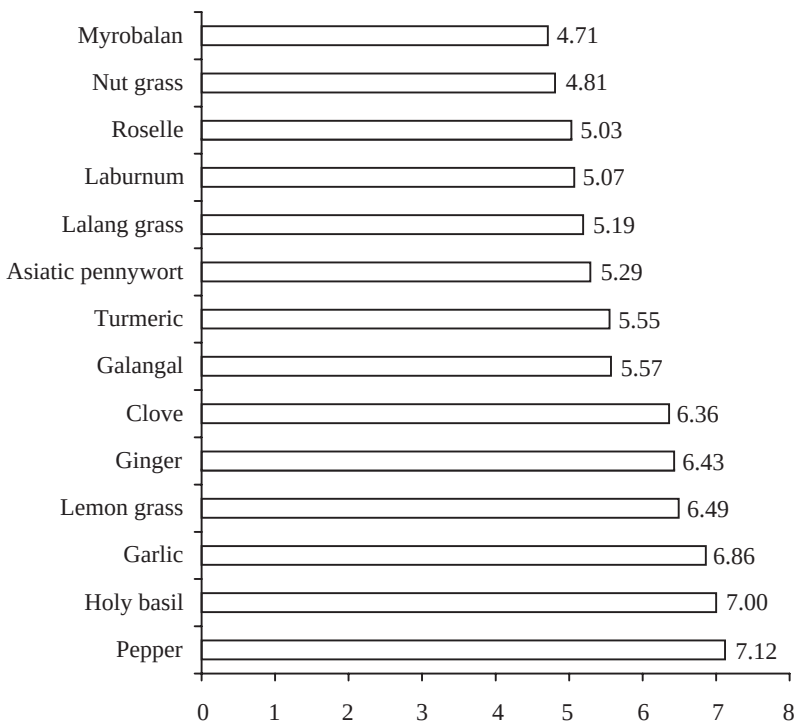

Figure 1 Mean of suitability scores of each Thai herbs responded by Thai respondents.

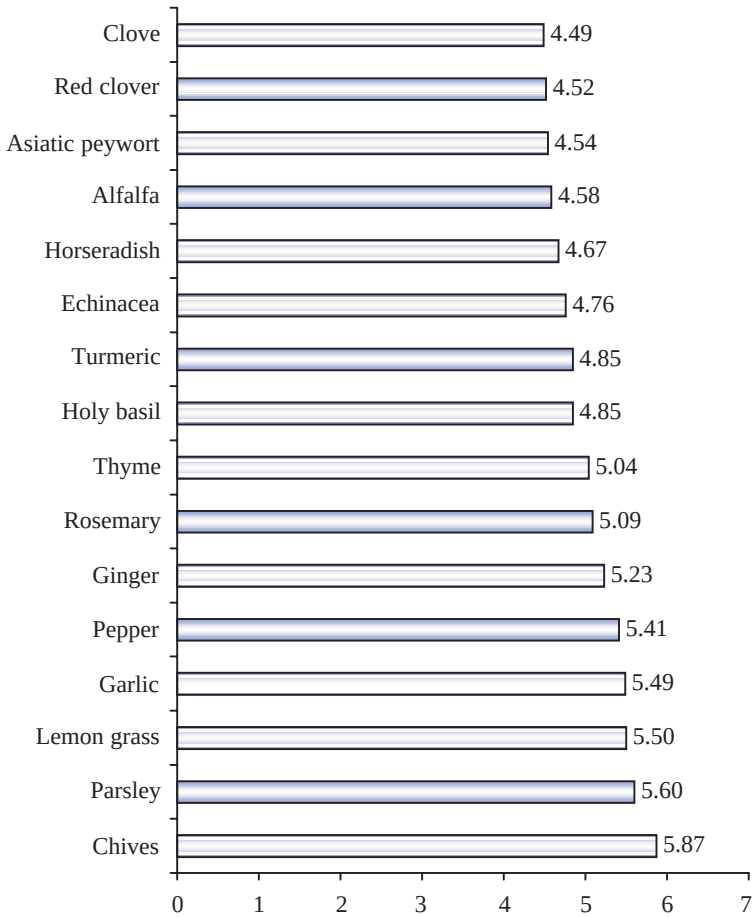

Figure 2 Mean of suitability scores of each Thai and New Zealand herbs responded by New Zealanders.

Table 2 The responses of suitability of using herbs in each snack category by Thai consumers.

	Compatible herbs	Score range of compatible herbs	Score range of all selected herbs
Prawn crackers	Pepper, garlic, holy basil	7.44-7.73	4.80-7.73
Dried fish snacks	Pepper, garlic, holy basil	7.67-7.84	4.63-7.84
Dried squid	Pepper, garlic, holy basil	7.65-7.81	4.58-7.81
Puffed snacks	Pepper, garlic, holy basil	7.45-7.76	4.69-7.76
Potato chips	Pepper, garlic, holy basil	7.32-7.78	4.54-7.78
Nuts	Pepper, garlic, holy basil, lemon grass, ginger	5.93-6.42	4.83-6.42
Popcorn	Laburnum, asiatic pennywort, lemon grass, lalang grass, roselle, turmeric	5.40-6.02	4.02-6.02

suitability of using horizontal axis related herbs were different between the group of 5 products, nuts and popcorn. The suitability of using vertical axis related herbs for prawn crackers were not similar to the other products. The suitability of using each herb for each product could be considered by projecting that product position on the vector of the interested herb (Lilien and Rangaswamy, 1998). The length of herb vectors showed the degree of suitability of using each herb as an ingredient in snacks. The vectors of holy basil, garlic and pepper being in the positive direction of the horizontal axis were longer than the other herbs' vectors. These meant they more suited to add in snacks, especially the ones located in the same direction. The vectors of laburnum, asiatic pennywort, and roselle were almost in the popcorn directions. It indicated their suitability to each other. (Figure 3)

For New Zealand respondents, their results for each product category are shown in Table 3.

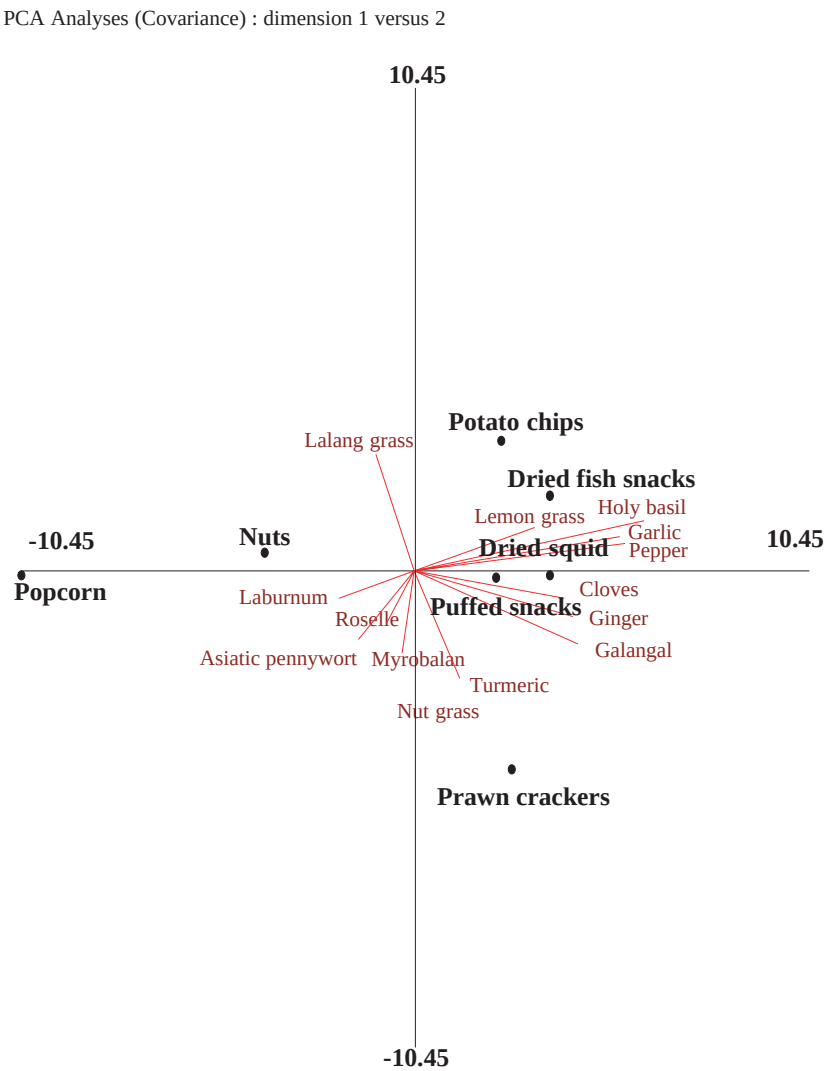

Figure 3 Perceptual mapping of the suitability scores of using herbs as functional ingredients in Thai commercial snacks by Thai respondents (Explained variance = 96 per cent).

Chives and parsley were more suitable than other NZ herbs for adding in prawn crackers, dried fish snacks, dried squid, and puffed snacks. Only NZ herb being compatible to potato chips was chives. There was no significant difference ($p>0.05$) in suitability scores between NZ herbs for nuts. Chives, parsley, echinacea, and rosemary were more properly to popcorn. For Thai herbs, garlic and lemon grass were more fitting to every snack category. Pepper also more suited for any category except nuts. Ginger was compatible to dried fish snacks, dried squid, puffed snacks, nuts, and popcorn, as well. However, the suitability scores of any herbs for nuts and popcorn were less than 5 (neither suitable nor unsuitable) as shown in Table3. It meant that there was no suitable herb identified for nuts and popcorn in New Zealanders' opinions.

A perceptual map of the suitability of adding herbs in snacks responded by New Zealanders was created as Figure 4. The suitability scores of 5 products and 15 herbs highly related to the horizontal axis (dimension 1). These 5 products were composed of prawn crackers, potato chips, puffed snacks, nuts, and popcorn and these 15 herbs were chives, parsley, thyme, red clover, rosemary, horseradish, echinacia, alfafa, turmeric, pepper, garlic, holy basil, lemon grass, asiatic pennywort, and cloves. The suitability scores of dried fish snacks, dried squid, and ginger highly related to the vertical axis (dimension 2). The positions of 7 products were unable to be grouped. However, all of the herb vectors were in the positive side of the horizontal axis. It meant that the more positive value of product position on the horizontal axis, the more suitability to use herbs as its ingredients. The longer vectors of NZ herbs reflected New Zealanders preferred to have NZ herbs in snack products rather than Thai herbs. The longer projections on the horizontal axis of the vectors for chives and parsley indicated their more compatibility to use in snacks. The similar length of the projections of Thai herb vectors on the horizontal axis indicated New Zealanders rated

Table 3 The responses of suitability of using herbs in each snack category by New Zealand consumers.

	Compatible herbs	Score range of compatible herbs	Score range of all selected herbs
Prawn crackers	NZ: chives, parsley	6.55-6.89	5.18-6.89
	TH: garlic, lemon grass, pepper	6.11-6.21	4.92-6.21
Dried fish snacks	NZ: chives, parsley	5.76-5.97	4.36-5.97
	TH: garlic, lemon grass, pepper, ginger	5.66-5.84	4.32-5.84
Dried squid	NZ: chives, parsley	5.50-5.55	4.18-5.55
	TH: garlic, lemon grass, pepper, ginger	5.37-5.73	4.50-5.73
Puffed snacks	NZ: chives, parsley	6.00-6.45	4.53-6.45
	TH: garlic, lemon grass, pepper, ginger	5.53-5.79	4.21-5.79
Potato chips	NZ: chives	7.34	5.24-7.34
	TH: garlic, lemon grass, pepper	5.94-6.50	4.76-6.50
Nuts	NZ: -	-	4.16-4.53
	TH: ginger, garlic, lemon grass, cloves, asiatic pennywort	4.37-4.79	4.00-4.78
Popcorn	NZ: chives, parsley, echinacea, rosemary	4.16-4.55	3.63-4.55
	TH: garlic, lemon grass, pepper, ginger, turmeric	4.13-4.74	3.74-4.73

only a small difference on the suitability of Thai herbs because they might not be much familiar to Thai herbs.

CONCLUSION

The idea to use herbs as functional ingredient in Thai commercial snack products seems to be possibly, especially for prawn crackers, dried fish snacks, dried squid, puffed snacks and potato chips which are savoury snacks. However, this concept must be further studied in details since the products which are going to be developed have to be designed to meet the combination of the good flavour and the sufficient quantity of herbs for both palatability and pharmacological activity of products.

ACKNOWLEDGEMENT

The authors wish to thank National Center for Genetic Engineering and Biotechology (BIOTEC), Thailand, for supporting funds in Thai consumer survey.

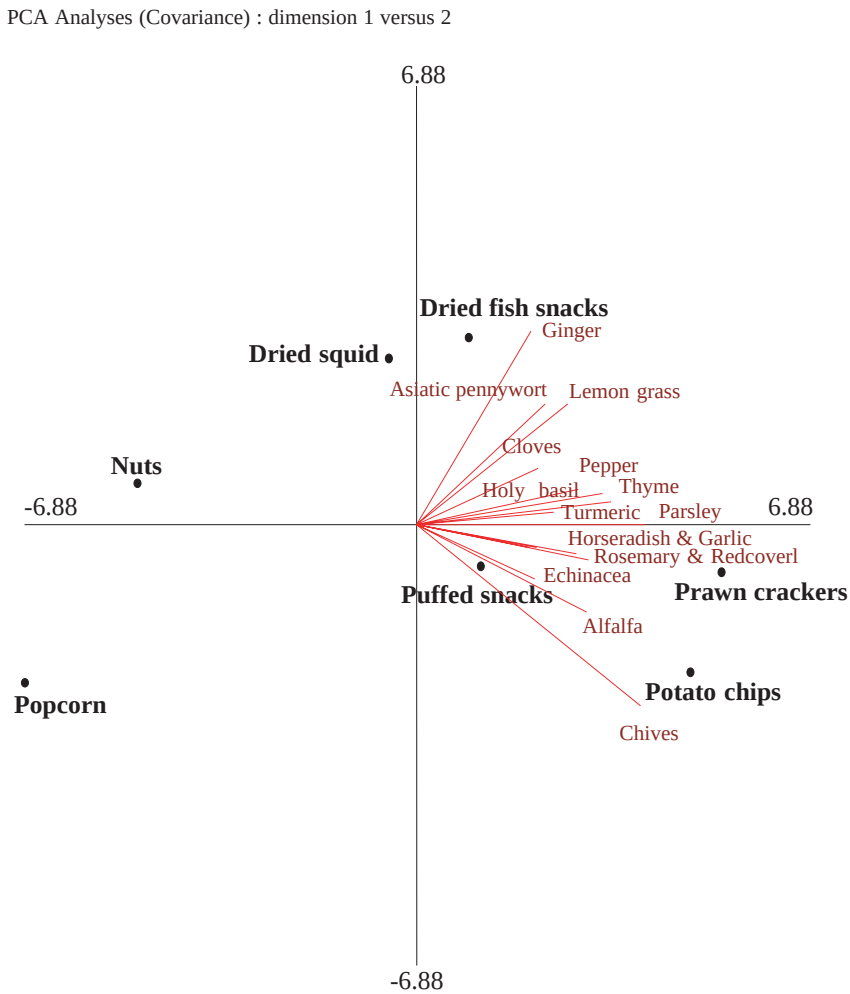

Figure 4 Perceptual mapping of the suitability scores of using herbs as functional ingredients in Thai commercial snacks by New Zealand respondents (Explained variance = 92 per cent).

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Received date : 04/11/02
Accepted date : 30/12/02