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Project leaders:	Dr Debbie Fuller Warwick HRI Wellesbourne Warwickshire CV35 8XT	Margaret Everitt [Consultant in consumer & sensory research] Sunrise Nurseries, Gretton Fields, Cheltenham, Gloucestershire, GL54 5HJ

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	PC 279 Final Report (2008)
Key workers:	Jayne Akehurst, Warwick-HRI
	Gillian Beard, Sensory Dimensions Ltd
	Ian Wakeling, Qi Statistics Ltd
Location:	Sensory Dimensions Ltd, Sensory Facility, Reading for consumer central location test (CLT)
	Warwick HRI, Wellesbourne for sensory panel profile assessment.
Project co-ordinators:	Gary Shorland, Double H (Nurseries) Ltd, Gore Road, New Milton, Hampshire, BH25 7NG
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The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

[Name]
[Position]
[Organisation]

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[Name]
[Position]
[Organisation]

Signature .... Date ....

Report authorised by:

[Name]
[Position]
[Organisation]

Signature .... Date ....

[Name]
[Position]
[Organisation]

Signature .... Date ....

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Grower Summary

Headline

For classic red 13cm poinsettias, consumer preference mapping has identified characteristics of poinsettia that are of equal if not greater importance than price.

Background and expected deliverables

Current estimates for UK poinsettia production are around 4-5 million pots produced annually. With 80% of these as standard 13cm types returning around £1.50 per pot (2007/8), the value to the industry for 13cm types alone is £6-7.5 Million. UK growers continue to face price pressure and competition from overseas production and choosing suitable varieties to meet existing demand is essential. Recent work examining consumer attitudes and perceptions to poinsettia suggested that quality and form are of equal or even greater importance to poinsettia purchase than price. Hence it is essential that growers make suitable selections from the wide range of varieties available for their own production systems and that they also adapt to current consumer requirements in order to maximise returns on their product.

Initial focus group studies in 2007 (PC 279) were well received by growers and this more detailed statistical evaluation within the current project helped to identify generic qualities that growers need to be aiming for both in the varieties selected and also in the production practices employed. Potential for market expansion beyond the traditional consumer was also explored. This information not only guides growers on their own production methods, but the independent nature of the study can also assist in discussions with retail customers.

Summary of the project and main conclusions

Consumer Preference Mapping has proved a very effective means of gaining in-depth knowledge about the characteristics of Poinsettia that are most important in satisfying consumer expectations and encouraging purchase both for the market in total and for defined segments i.e. groups of consumers from within the total market who show similar patterns of liking towards a set of products, in this case poinsettia plants.

Plants that offer the best combination of the following positive characteristics will have the best purchase potential within the market overall:

- uniformity of bract star growth; around 78% of consumers prefer the growth to be uniform and flat rather than 'straggly' and layered
- broad developed individual bract width
- smoothness of bract surface i.e. less crinkly in appearance
- overall uniformity of green leaf size

Characteristics that most need to be minimised or avoided are:

- layered head shape
- variation of colour across bracts
- bareness of ankle
- presence of scars resulting from cyathia abscission.

Three distinct "Liking" segments were identified within the market and these offer the potential for a range of varieties to be grown and targeted according to a specific consumer segment:

- Approximately 36% of the market will be willing to experience new / novel varieties in addition to those seen as traditional.

- Approximately 42% of the market has strong traditional views about poinsettia particularly about colour in that the bract stars should be deep red with contrasting deep green foliage. This group will therefore be less willing to compromise about variation in the key liking drivers compared to the other two.

- Approximately 22% of the market show a more liberal attitude towards differences in plant characteristics as long as they are seen as fundamentally 'traditional' and the key negative characteristics especially cyathia abscission

are avoided. This group of consumers are also likely, with careful marketing, to be willing to trial the more novel varieties than group 2.

There were no strong demographic factors such as age or gender affecting liking segmentation

Correlations between the key sensory attributes driving liking and the other sensory attributes were identified and this provides clear guidance of how one feature can affect perception of another.   Given this level of detail, precise links can be made with the technical factors relating both to breeding and cultivation practices that will aid development of the key positive attributes and best control the key negative ones.

Contrary to some concern from within the industry the results from the Usage and Attitude questions show that poinsettia are not thought to be old fashioned as around 75% of the consumer sample considered them to be stylish and suitable for use in modern décor. Neither was there a strong view that they are only suitable as gifts for older adults. The strong association that consumers have with poinsettia and the Christmas season appears to be primarily due to this being the only time they see them available.   The indication was that around 50% of current purchasers would like them to be available at other times. This could also provide opportunity to gain acceptance of a wider range of colours.

Poinsettia are also thought to provide good value for money although over half of the consumers taking part in the research thought they are difficult to keep looking healthy.

Financial benefits

The detailed understanding now gained about the plant characteristics that are most important to consumers' acceptance and hence purchase of poinsettias should enable growers to achieve a more realistic balance between their commercial practices and the markets preferred plant quality which in the medium to longer term should show financial benefit.

The potential to develop sales opportunities at times other than Christmas may also be a possibility for some.

Action points for growers

1.   Consumer preferences can contribute to production planning and management and in negotiations with customers. Specifics will vary according to customer base and agreed prices but some suggestions include:

- Aim for flowering (i.e. cyathia development) to be as close as possible to marketing windows in order to avoid cyathia abscission. Consider phased flowering times for longer marketing windows.
- Consider the balance of pots per square meter against final plant shape and returns in consultation with buyers (particularly in the context that results suggest that consumers consider quality to be of at least equal importance to price).
- Consider how product range fits in with the identified market segments in terms of proportions of product that fit the preferences described for the three main segments. e.g.:
  - Deep red varieties that contrast well with deep green foliage could be placed together to promote a traditional image.
  - Brighter red varieties and alternative colours could be placed in another display to promote a lively, vibrant image to appeal to the more adventurous consumer.

2.   Promotion to consumers should be done in their 'language' and should emphasise positive qualities e.g. large, uniform 'flowers', fullness of growth, depth / richness of colour.
- Consider visual promotion of plants shown in a variety of modern settings to develop 'stylish' image.
- Ensure plant care instructions are highlighted; with particular emphasis on the most important criteria to develop 'easy care' image.

Science Section

Introduction

HDC has funded poinsettia variety trials over a number of years and these trials have been well received by the industry. To date, varieties have been evaluated against current retailer specifications for the product rather than against consumer preferences. Furthermore, price pressure is turning the poinsettia into a commodity item. There was insufficient knowledge within the industry about consumers' expectations and the particular plant characteristics that stimulate sales. Trials in 2007 were extended to include studies aimed to identify consumer requirements in this sector. Plant quality was found to be of equal if not greater importance than price; and quality was synonymous with the apparent healthiness of a plant in the minds of many. Several features of the bract stars, foliage and overall shape of the plant were identified as important cues to the overall impression of quality which was closely linked to perceived healthiness (PC 279).

PC 288 was commissioned to quantify how important these characteristics were in relation to the market as a whole and also to specific consumer segments within it.

Primary objectives
- To confirm and quantify characteristics of greatest importance in encouraging consumers to purchase or reject poinsettia plants.
- To enable breeders and growers to manage their commercial selection and production of varieties with increased consumer focus.

Secondary objectives
- To determine to what extent preference is segmented within the market and how this affects the priority of the key characteristics between segments.
- To establish to what extent preference is influenced by consumer demographics and or usage criteria.
- To identify the potential for less traditional varieties within the market.

Materials and methods

Twelve red poinsettia varieties in 13cm pots (10 classic, one novel and one cultivar in development) were used in the research. These were selected in order to provide examples of the range of characteristics that were highlighted as being important by the earlier focus groups when making their purchase decisions e.g. bract width, openness of growth, size of

bract star, leaf width and shape (PC 279). The selection was not intended to represent the range of varieties available from the breeding companies as has been the case in previous variety trials (e.g. PC 156).

The research involved capturing two types of data about the plants:
- consumers' degree of liking of defined aspects of each plant plus their responses to a list of 'attitudinal' statements (the Central Location Test),
- a comprehensive set of sensory intensity measurements of the plant characteristics using a selected sensory panel (Sensory Profile Assessment).

Consumer Central Location Test (CLT)
A total of 144 consumers were pre-recruited using a questionnaire (see Appendix 1) according to defined criteria. Primary factors were that they:
- All had to purchase flowers and/or pot plants at least 4 times a year.
- All had to be aware of poinsettia plants, a minimum of 50% had to be current purchasers.

Assessment sessions were held at Sensory Dimensions sensory research facility in Reading, UK on 3rd and 4th December 2008. Each consumer assessed all 12 varieties of poinsettia during a one hour session. Six sessions were held on each of the two days. 128 consumers completed the study.

Products were presented under code using a balanced serving order to minimise assessment bias; 3 examples of each variety were in use at a time and a fresh set of plants was used for the second day's sessions.

Assessments were conducted under North light (artificial day light) and the data was captured via computer using Compusense® sensory software.

To help consumers understand the procedure and avoid misinterpretation of the questions, standard instructions were given at the start of each session using a plant to explain the meaning of terms such as 'bracts, buds, flower heads'. (Appendix 2 shows examples of the two consumer questionnaires plus the Verbatim instruction sheet).

Sensory Profile Assessment
The sensory panel comprised 8 experts from within the industry (breeders, growers, researchers). Prior to the sensory profile assessment, assessors attended a half day intensive training session to learn about the assessment procedure and to generate and agree a comprehensive list of sensory attributes against which to rate the plants.

The sensory profile assessment was conducted on the 25th November 2009. Plants were presented under code, in a randomised order to minimise assessment bias. Assessments were conducted under natural day light in a glasshouse at Warwick HRI.

Two replicates of each variety were evaluated independently by each assessor.
The intensity of each 'sensory attribute' was rated on an unstructured line scale ranging from '0' = 'NONE' to '100' = 'a lot'. (Appendix 3 shows an example of the sensory assessment form).

The raw data was processed in an Excel spread sheet for analysis.

Data analysis
Each data set was first independently statistically analysed using Analysis of Variance plus a multiple comparison test to determine for which characteristics differences have been recorded between the plants both in level of liking and also sensory intensity.

The consumer data were then pre-treated using a Clustering method (in this case Ward's method) to determine to what extent liking is segmented across the consumer sample. The sensory data were then correlated with the liking data using a programme of regression methods known as *Preference Mapping*. In this study *'Extended Internal' Preference Mapping* was primarily used as this is most suitable for identifying the key characteristics that affect consumers' level of liking.

Results and discussion

Consumer sample

Demographic Profile

The socio economic quota fell out naturally based on respondents' frequency of plant purchase. Age and gender had been recruited to quota (refer to recruitment questionnaire Appendix 1):

- 68% were female
- 62% fell into the 'older' age range i.e. 40-65+
- 83% were from socio economic class A,B, C1 i.e. white collar workers and professionals
- 67% purchase poinsettia every year

age	N	%
25-39	48	38
40-65+	80	63
Total	128	100

gender	N	%
Male	41	32
Female	87	68
Total	128	100

social economic class	N	%
ABC1	106	83
C2DE	22	17
Total	128	100

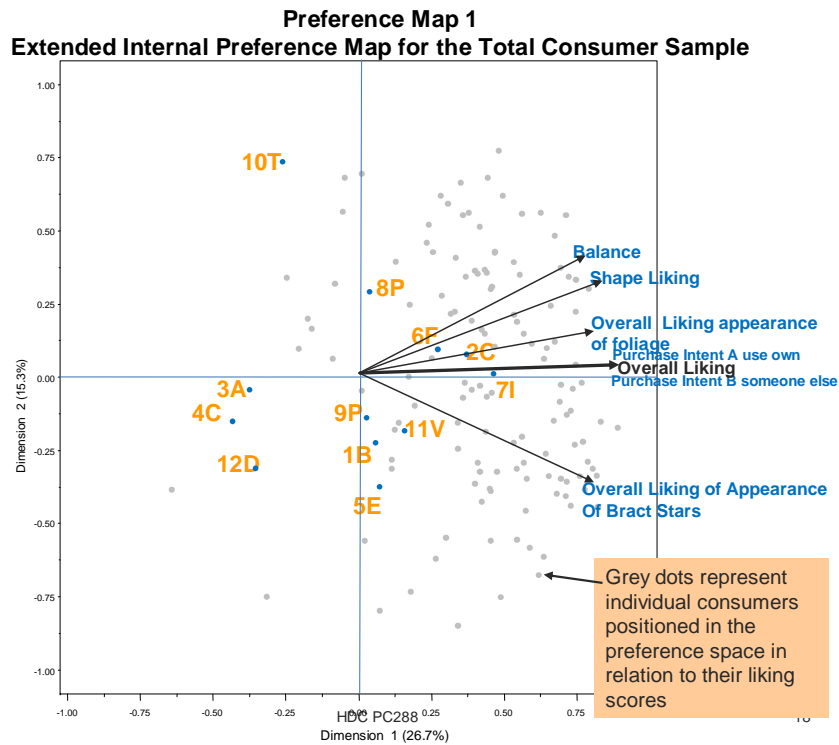| frequency of purchase	N	%
Do not buy	33	26
Every year	86	67
Every other year	8	6
Less frequently	1	1
Total	128	100

Of those that currently bought poinsettia the majority bought from a supermarket
- Asda, Sainsbury and Tesco were the most popular supermarkets
- Wyevale was the most popular Garden Centre
  - The popularity of Asda and Wyevale was possibly due more to both companies having major stores close to the test location rather than it being representative of a national trend in poinsettia purchase

where purchased	N	%
Do not buy	33	26
Supermarket	63	49
Garden Centre	18	14
Retail Outlet	1	1
Florist	13	10
Total	128	100

outlet where purchased	N	%
ASDA	22	27
B+Q	2	2
Grovelands	2	2
Hare Hatch	3	4
Henry Street	2	2
Homebase	2	2
M&S	6	7
Morrisons	1	1
Sainsburys	16	19
Tesco	13	16
Waitrose	5	6
Wyevale	8	10
Total	82	100

Preference mapping analysis

Preference Map 1
Extended Internal Preference Map for the Total Consumer Sample

Grey dots represent individual consumers positioned in the preference space in relation to their liking scores

Preference Map 1 shows that for the consumer sample in total, products 7I and 2C were most liked out of the 12 varieties as they are positioned the furthest over along liking dimension 1 (horizontal axis) in the direction of overall liking which as illustrated, is highly

correlated to purchase intent both for own use and as a gift (all three vectors / arrows overlap).

Products 12D, 4C and 4A were similarly the least liked and the least likely to be purchased as they are most opposed to the direction of liking.

Products 8P, 9P, 1B and 5E were all similarly, moderately liked by the consumer sample.

However preference segmentation (discussed later) showed distinct differences in the level of liking between these products particularly 8P and 5E which is indicated in Preference Map 1 by the way the products are separated from each other along liking dimension 2 (vertical axis).
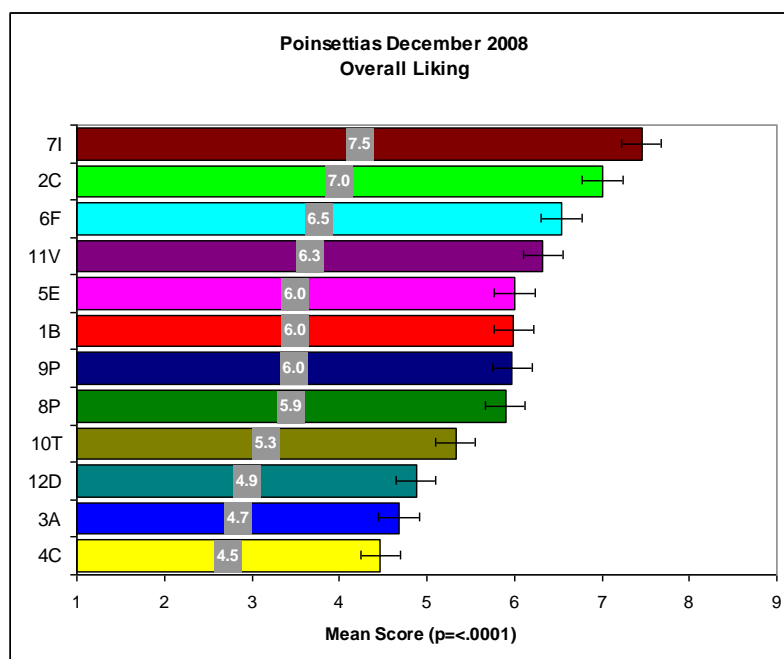
Poinsettias December 2008
Overall Liking

Product	Mean Score
7I	7.5
2C	7.0
6F	6.5
11V	6.3
5E	6.0
1B	6.0
9P	6.0
8P	5.9
10T	5.3
12D	4.9
3A	4.7
4C	4.5

Mean Score (p=<.0001)

Chart 1: Consumer mean scores for Overall Liking (The means score table for all consumer responses is shown in Appendix 4).

Chart one shows the mean overall liking scores for all twelve poinsettia with statistical 'whisker' bars to show significant changes in the liking levels i.e. where the whisker bars overlap there is no statistical difference in the level of liking between those plants. Products 5E, 1B, 9P and 8P all appear to similarly liked; it is only by applying Cluster analysis that the high deviation in consumers acceptance of these products is identified.

**Regression of sensory data with liking data**

The key characteristics that drive liking were identified by regressing the sensory data into the liking space.

Preference Map 2 shows the relationship of the products with the sensory attributes used to describe the plant shape plus the bract stars while **Preference Map 3** illustrates the relationship with the attributes used to describe the cyathia plus the plant foliage i.e. green leaves.

Attributes that are pulled out furthest from the centre of the Preference plot are the most important in discriminating the products from each other in relation to liking. Attributes that sit close to the centre of the Preference space are not important discriminating characteristics.

Overall Liking is <u>towards</u> plants that have:

- balanced width to height ratio
- overall uniformity of bract star growth
- broad developed bract width
- smoothness of bract surface
- dense leaf growth
- a higher amount of overall leaf area
- overall uniformity of leaf size
- broader leaf width
- deeper depth of colour top and under leaf
- smooth leaf surface

Preference Map 2
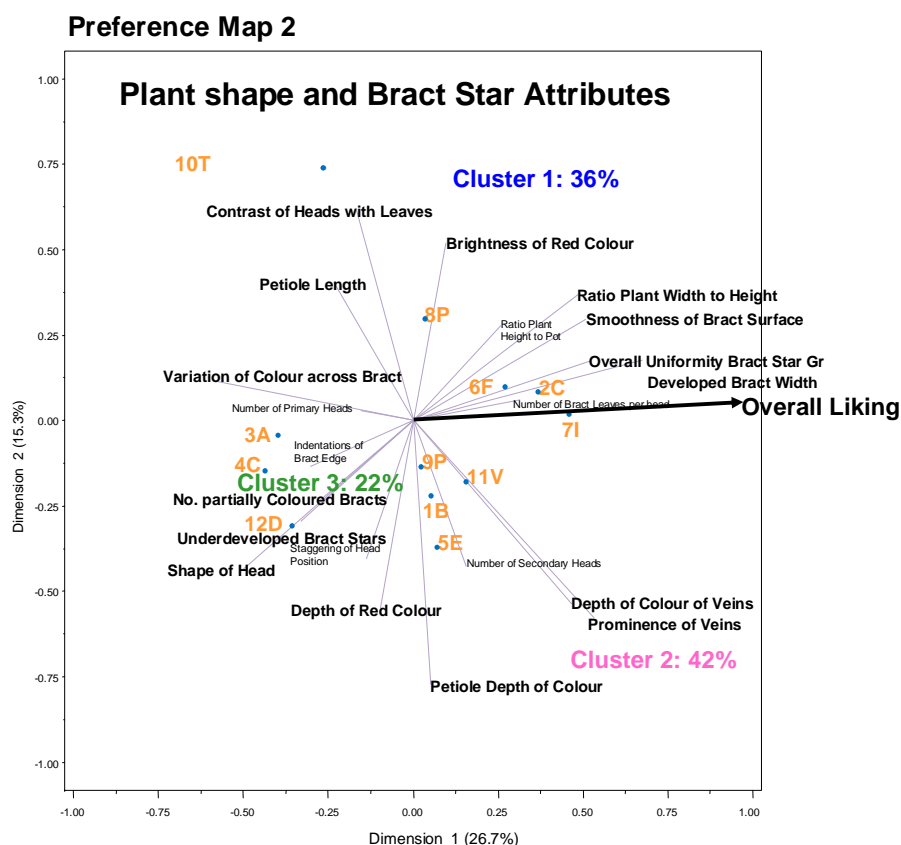
Overall Liking is <u>directly opposed</u> to plants that have a:

- higher proportion of underdeveloped bract stars
- a higher number of partially coloured bracts
- variation of colour across bracts
- a layered head shape (i.e.' shape of head' on Prefmap 2)

- bareness of ankle

- longer inter-nodal length

- inclination of leaf angle -- right angles with stem most preferred

Preference Map 3
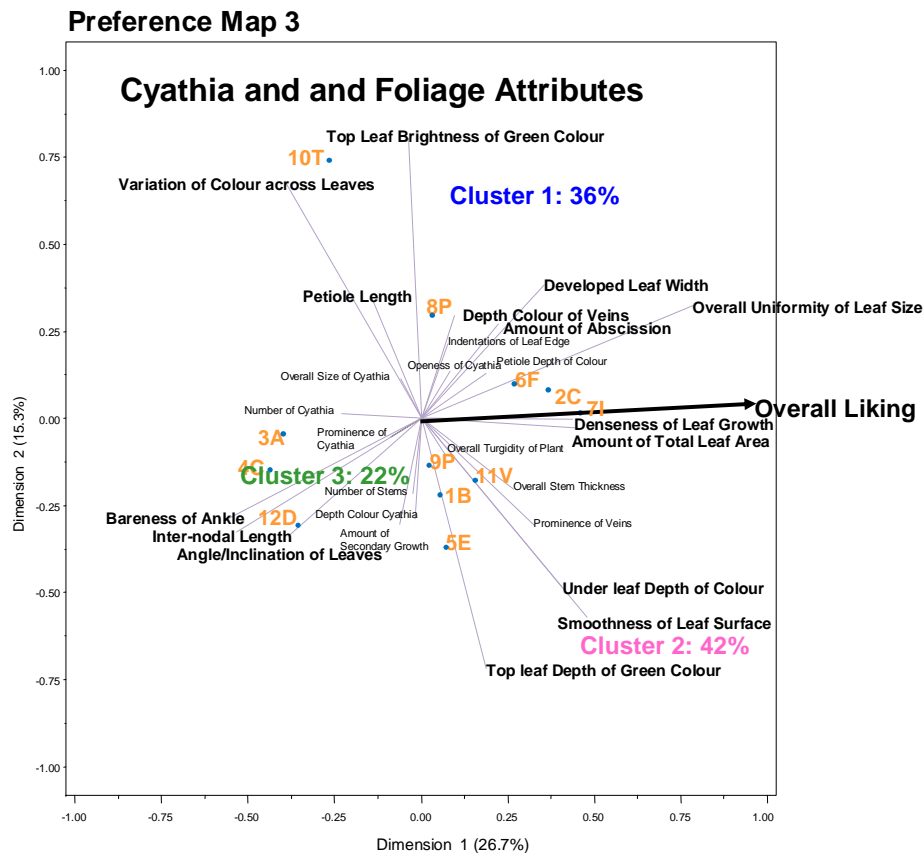
Attributes that appear to take precedence at a segmented level are those pulled out more at right angles to dimension 1 towards either the top or bottom of the map:

To the top

- contrast of red with leaves

- brightness of red

- petiole length

- brightness of top of leaf green colour

- variation of colour across leaves

To the bottom

- depth of red colour

- petiole depth of colour

- prominence of plus depth of colour of veins

- top leaf depth of green colour

- under leaf depth of colour

- smoothness of leaf surface

Characteristics of the cyathia e.g. amount, size, prominence were not identified as key attributes. However consumer liking was influenced by the presence of abscised cyathia especially at a segmented liking level

Key drivers of liking

Attributes with liking correlation coefficients greater than +0.5 or -0.5 and p values <0.1 are identified for the total consumer sample and for each segment.
(Appendix 5 shows the Cluster sensory attribute correlation table)
For the total consumer sample, the following attributes were the most important in affecting liking with wide developed bract width and overall uniformity of leaf size being weighted most important of all.

Positives i.e. what consumers especially like

	Correlation Coefficient
• Uniform bract star growth	0.53
• Wider rather than narrow developed bract width	0.67
• Smooth bract surface	0.55
• Overall uniformity of leaf size	0.76

Negatives i.e. what consumers especially dislike

• Layered, straggly bract star growth	-0.51
• Variation of colour across bracts	-0.55
• Bare ankle	-0.56

Liking Segmentation

Three liking segments were identified each with their own distinct liking patterns towards the plants as illustrated in Chart 2. Cluster analysis is done using Ward's method on normalised liking scores.

Chart 2: Cluster chart showing three consumer liking segments
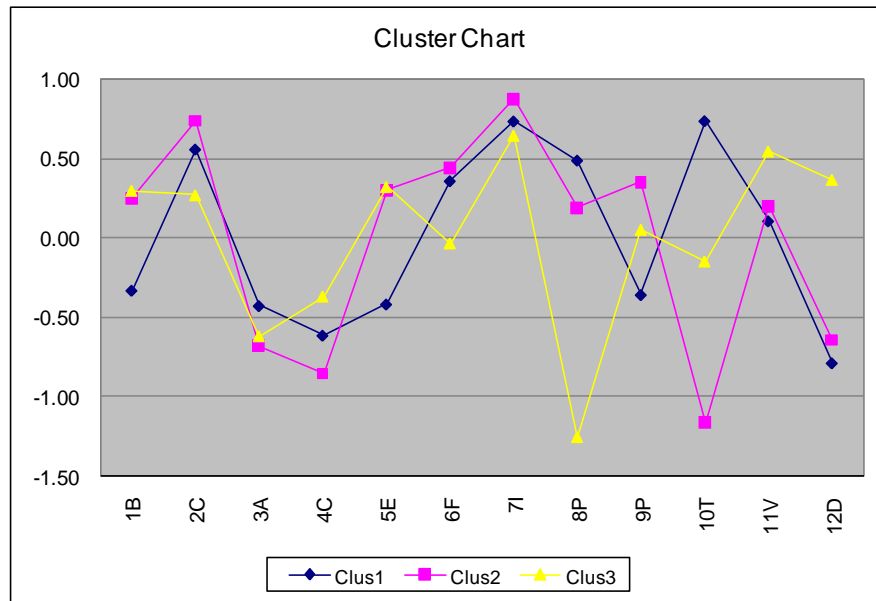
- Products 7I and 2C are well liked by all segments
- Products 1B, 5E, 8P, 10T and 12D as indicated by the Preference Mapping plot, show a high degree of liking segmentation
- Products 3A and 4C are disliked by all segments

Cluster 1 accounts for 36% of the consumer sample. These represent the more adventurous minded consumer as they like the novel variety 10T as much as the traditional types i.e. 7I and 2C.

Cluster 2 accounts for 42% of the sample and represents the true traditionalists as they really dislike 10T and love 7I and 2C.

Cluster 3 accounts for 22% of the sample. They like 7I along with 11V the most and really dislike 8P. These also represent traditionally minded consumers but with more 'relaxed' expectations than Cluster 2 and therefore are possibly more open to persuasion with newer, unusual varieties.

Analysis of Variance was conducted on each Consumer Segment to determine the different levels of liking between the products. Extended internal Preference Mapping was then applied to establish the key liking drivers for each segment.

Cluster 1

This segment is more affected than the others by:

- Brightness of bract stars – dull is a negative,
- Position of bracts stars – staggering within the plant is a negative,
- Width to height ratio – lack of balance is a negative.

CLUSTER 1 Adventurous Minded

POSITIVE DRIVERS   Correlation coefficient

- Balance of width to height   0.60
- Uniform bract star growth   0.56
- Wide developed bract width   0.59
- Smooth bract surface   0.57
- Bright top leaf colour   0.57
- Wide developed leaf width   0.53
- Uniformity of leaf size   0.70

NEGATIVE DRIVERS

- Staggered head shape   -0.71
- Staggering of bract stars   -0.52
- Long leaf inter-nodal length -0.61
- Inclination of leaves   -0.54
- Bare ankle   -0.60

Anova Table 1
Cluster 1 : Least Significant Difference=0.3453

Significance bars			n	Variety
	A	0.7319	46	10T
	A			
	A	0.7303	46	7I
	A			
	A	0.5535	46	2C
B	A			
B	A	0.484	46	8P
B				
B	C	0.3544	46	6F
B	C			
	C	0.1022	46	11V
	D	-0.3343	46	1B
	D			
	D	-0.3617	46	9P
	D			
	D	-0.4212	46	5E
	D			
	D	-0.4311	46	3A
	D			
	D	-0.6171	46	4C
	D			
E				
E		-0.7908	46	12D

Statistically 10T (novel), 7I, 2C and 8P (all traditional) were similarly liked the most by this cluster. 4C and 12D were the least liked. Bareness of ankle together with less uniformity of bract star growth, longer internodal length and more staggered head position within the plant accounted for these two plants being less liked.

This segment was the only one to show the influence of any demographic factors on liking as it had an older age profile i.e. 74% respondents aged 40 to 65+.

CLUSTER 2 Strong Traditionalists

POSITIVE DRIVERS   Correlation coefficient

- Prominence of veins   0.61
- Depth of vein colour   0.51
- Developed bract width   0.55
- Depth of colour under-leaf   0.50
- Smooth leaf surface   0.62
- Uniformity of leaf size   0.64

NEGATIVE DRIVERS

- Colour variation across bracts -0.56
- Colour variation across leaves -0.52

Anova Table 2
Cluster 2 : Least Significant Difference=0.2858

Significance Bars	n	Variety
A	0.8749	54	7I
A	0.7387	54	2C
B	0.4429	54	6F
B			
B	0.3489	54	9P
B			
B	0.2998	54	E5
B			
B	0.2514	54	1B
B			
B	0.199	54	11V
B			
B	0.1895	54	8P
C	-0.6432	54	12D
C			
C	-0.68	54	3A
C			
C	-0.8566	54	4C
D	-1.1653	54	10T

Depth of colour (bracts and leaves) and characteristics of the plant foliage are more important to this group than Cluster 1.

Colour variation across both bract and leaf is a particular negative.

This group are very distinct about what they like and don't like and are particularly averse to characteristics that do not meet their 'traditional' expectations e.g. variegated leaf colour of 10T.

Cluster 3 Relaxed Traditionalists

POSITIVE DRIVERS   Correlation coefficient

- Prominence of veins   0.56

- Depth of vein colour   0.69

- Petiole depth of colour   0.56

NEGATIVE DRIVERS

- Amount of abscission   -0.52

Anova Table 3
Cluster 3 : Least Significant Difference=0.4500

Significance Bars			n	Variety
	A		0.6389	28	7I
	A				
	A		0.54	28	11V
	A				
	A		0.361	28	12D
B	A				
B	A		0.3151	28	E5
B	A				
B	A	C	0.2916	28	B1
B	A	C			
B	A	C	0.2635	28	2C
B		C			
B	D	C	0.0457	28	P9
B	D	C			
B	D	C	-0.0401	28	F6
B	D	C			
	D	C	-0.154	28	10T
	D				
	D		-0.3752	28	4C
E					
E			-0.6254	28	3A
E					
	F		-1.2614	28	8P

This group accept a wider variation in the plant characteristics compared to the other two. Although plants 7I and 11V are the most liked, statistically there is no significant difference in liking between them and plants 12D, 5E, 1B and 2C.

This group appear to be more influenced by the presence of key negative drivers.

They strongly disliked plant 8P primarily due to the presence scars resulting from cyathia abscission plus lack of petiole depth of colour and lack of depth of vein colour.

The following characteristics appear to be much less important to this group than the other two:

- Plant width to height ratio – they appear to like a taller rather than short plant

- Overall uniformity of bract star growth

- Overall uniformity of leaf size

- Bareness of ankle

Correlation of key liking drivers with other sensory attributes

Regression analysis also identified to what extent the sensory attributes (as defined by the sensory panel) are linked to each other either positively or negatively. This helps to further understand which other attributes affect perception of the key liking drivers and in turn provides the focus to better diagnose which aspects of the propagation and cultivation processes will require the greatest manipulation and control to produce the best combination of the desired plant features.

Plant balance and shape

As shown in Preference map 1, plant balance and shape is closely correlated with consumers' overall liking and likelihood of purchase. Plant width to height and also height to pot ratios affect perception of the overall balance of shape of a plant.

The **width to height** ratio is perceived as more unbalanced as:

- head shape becomes more straggly, layered
- bareness of ankle increases
- the total amount of leaf area decreases

The **height to pot ratio** is perceived as more unbalanced as:

- the inter-nodal length increases
- the angle of the leaf becomes more acute with the stem, especially if angled downwards
- the width to height ratio becomes more unbalanced

These attributes therefore need to be controlled to help keep the overall shape of the plant as balanced as possible.

Bract stars

To aid perception that the **bract width** is wide rather than narrow:

- the number of underdeveloped bract stars need to be kept to a minimum,
- the developed green leaf width is broad rather than narrow.

To help **bract star growth** look uniform rather than straggly:

- there needs to be little or no bract colour variation,
- long inter-nodal length needs to be avoided.

If petiole length is kept short there is perception of a greater **number of bracts per star.**

The **depth of red colour** is seen to increase as brightness of the colour decreases.

Bract colour variation will be perceived to increase as the inter-nodal length becomes longer.

The **amount of cyathia abscission** increases as the plant appears to become less turgid.

Foliage i.e. green leaves

To help avoid bareness of ankle:

- the inter-nodal length needs to be kept short,
- the total amount of leaf area and leaf growth needs to be perceived as dense,
- variability in leaf size needs to be kept to a minimum.

To aid perception of a broad developed leaf width:

- the amount of secondary leaf growth needs to be kept to a minimum,
- the number of under-developed bract stars needs to be kept to a minimum.

Depth of top leaf colour is seen to be darker the more:

- the variation in leaf colour is kept to a minimum,
- the brightness of the bracts and also the leaves decreases.

The leaf colour variation is perceived to increase if:

- the bract petiole depth of colour becomes paler,
- the under-leaf depth of colour becomes paler.

Examples from the research plants

The following plants illustrate to varying degrees combinations of several of the positive characteristics i.e.:

Broad bracts & leaves, dense growth, uniform more than straggly bract stars, bract stars positioned towards top of plant, width to height balance.

Combinations of these characteristics are more likely to encourage purchase.

The following plants illustrate to varying degrees combinations of several of the negative characteristics i.e.:

Narrow width of bracts & leaves, variation of colour across bracts, unbalanced shape, bareness of ankle, openness of growth, straggly growth of bract stars.

Combinations of these characteristics are more likely to deter purchase.

Liking Segmentation

The following six examples are those that created a high degree of segmentation in consumers' liking responses.

The plant on the left was not deep enough in colour for some, particularly Cluster 3 (22%), whereas the plant on the right was too dull especially for consumers in Cluster 1 (36%).

The plant on the left was reasonably well liked by Cluster 2 (42%), neither liked nor disliked by Cluster 3 (22%) and disliked by Cluster 1 (36%) i.e. ~ 40% of the market may consider buying it.

The main issues were that the width to height ratio was unbalanced (too wide), the growth was too open, the bracts and leaves were too narrow and the inclination of the leaf pointed downwards.

The plant on the right was reasonably well liked by Cluster 1 & 3 (58%) but disliked by Cluster 2 (42%) i.e. this plant may be considered for purchase by ~60% of the market.

The main issues were that the width to height ratio was unbalanced (too tall), the foliage growth was too open plus the bract stars were too straggly.

The plant to the left was reasonably well liked by Cluster 1 (36%) and disliked by the other two (64%) i.e. around 35% of the market may consider purchasing this plant.

The main issues were that the width to height ratio was unbalanced (too short) plus the bract stars were too broad and not spiky enough.

The plant to the right was very well liked by Cluster 1 (36%), really disliked by Cluster (42%) and slightly disliked by Cluster 3 (22%) i.e. around 35% of the market are likely to consider purchasing this plant.

For Cluster 2 (strong traditionalists) the variation plus lack of depth of the leaf colour was too different from their expectations.

Other issues were that the width to height ratio was unbalanced (too wide), bract star growth was too straggly and the foliage growth was too open.

Attitude & usage responses

After all twelve poinsettia plants had been evaluated, each consumer completed an Exit Questionnaire comprising ten questions relating to attitude towards and usage of Poinsettia.

Responses were given using a seven point agree / disagree scale where 'completely disagree' was on the left and 'completely agree' was on the right. Charts 3 & 4 show the percentage of responses recorded for each category on the scale per question.
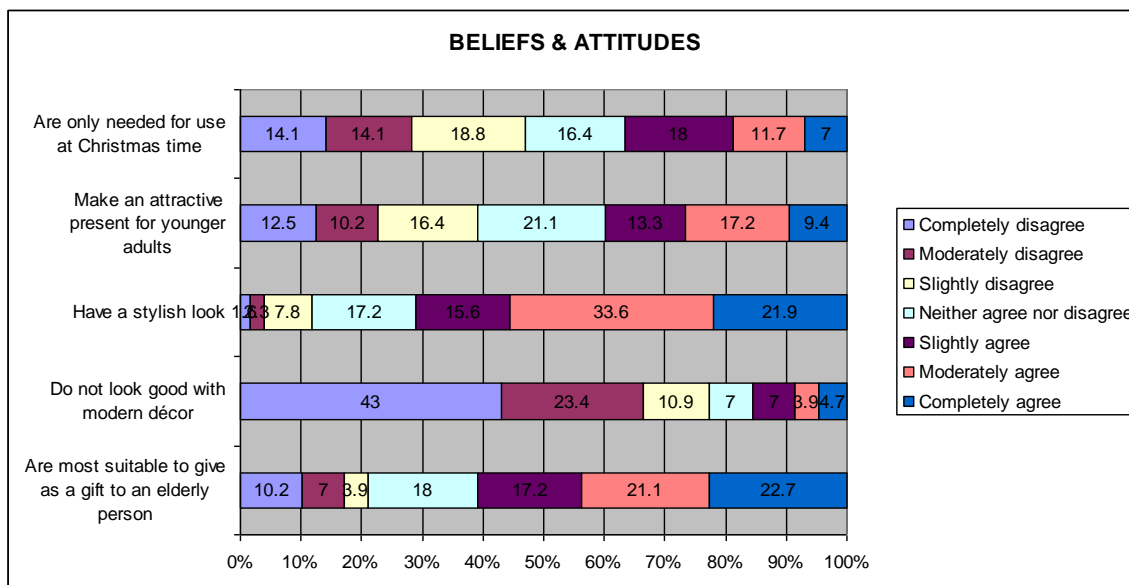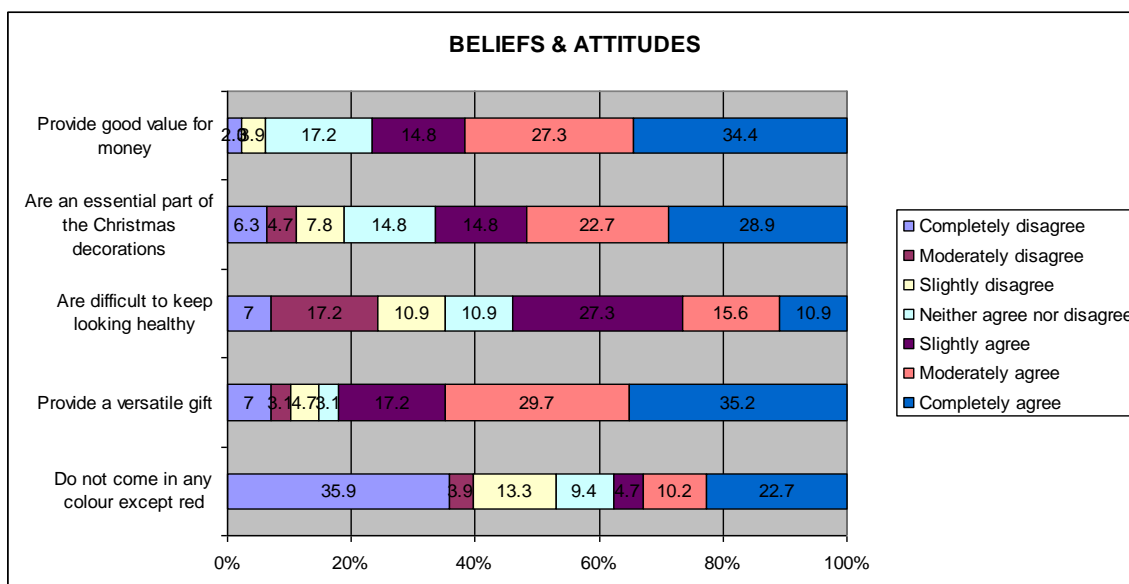
Chart 3

BELIEFS & ATTITUDES

Statement	Completely disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Completely agree
Are only needed for use at Christmas time	14.1	14.1	18.8	16.4	18	11.7	7
Make an attractive present for younger adults	12.5	10.2	16.4	21.1	13.3	17.2	9.4
Have a stylish look	1.6	3	7.8	17.2	15.6	33.6	21.9
Do not look good with modern décor	43	23.4	10.9	7	7	3.9	4.7
Are most suitable to give as a gift to an elderly person	10.2	7	3.9	18	17.2	21.1	22.7

Chart 4

BELIEFS & ATTITUDES

Statement	Completely disagree	Moderately disagree	Slightly disagree	Neither agree nor disagree	Slightly agree	Moderately agree	Completely agree
Provide good value for money	2.3		3.9	17.2	14.8	27.3	34.4
Are an essential part of the Christmas decorations	6.3	4.7	7.8	14.8	14.8	22.7	28.9
Are difficult to keep looking healthy	7	17.2	10.9	10.9	27.3	15.6	10.9
Provide a versatile gift	7	3.1	4.7	3.1	17.2	29.7	35.2
Do not come in any colour except red	35.9	3.9	13.3	9.4	4.7	10.2	22.7

Contrary to some assumptions within the industry, the results showed that poinsettia are not thought to have an old fashioned image. Around 75% of the respondents considered them to be stylish and suitable for use in modern décor.

61% thought they are more suitable as a gift for older rather than younger adults although there was no evidence of a strong view against the latter as only 39% thought they would not make a suitable gift for younger adults. Visual promotion of plants in modern settings could help attract and encourage purchase from younger consumers.

Although poinsettia are definitely expected to be available at Christmas there was no strong view that this is the only season they should be available, only 30% stated that poinsettia were only needed at this time of year.

Poinsettia were thought to provide good value for money and to be a versatile gift by the majority of respondents; 76% for the former, 82% for the latter.

Around 50% of respondents were not aware or unsure if poinsettia came in any other colour than red. As long as the plants fundamentally demonstrate the key positive liking drivers there is therefore opportunity to promote other colours.

Also a good 50% of respondents thought that poinsettia are difficult to keep looking healthy and were unsure how to care for the plants. This suggests that communication about where and how to keep poinsettia needs to be improved and more prominently highlighted to consumers.

Conclusion

The work has shown that the market can be satisfied by a range of poinsettia varieties so long as the plants demonstrate a combination of the key positive liking drivers and have few or none of the key negative characteristics.

Key attributes that should be considered to maximise consumer liking include....

> Broad bracts & leaves, dense growth, uniform more than straggly bract stars, bract stars positioned towards top of plant, width to height balance.

Key attributes that are negatively correlated with consumer liking and which therefore need to be avoided include.....

> Narrow width of bracts & leaves, variation of colour across bracts, unbalanced shape, bareness of ankle, openness of growth, straggly growth of bract stars.

In addition to overall market preferences, three market segments have been identified in consumer preferences for poinsettias. The fact that unique combinations of key characteristics are liked by these segments of consumers offers an opportunity to promote differences between products and tailor promotion for specific groups e.g.:

> Deep red varieties that contrast well with deep green foliage could be placed together to promote a traditional image.

Brighter red varieties and alternative colours could be placed in another display to promote a lively, vibrant image to appeal to the more adventurous consumer.

The range of varieties bred and grown should be selected to suit the commercial practice and agronomic conditions of individual growers in order to produce plants with the desired attributes.

Promotion to consumers should be done in their 'language' and can emphasise positive qualities e.g. large, uniform 'flowers', fullness of growth, depth / richness of colour.

Growers can maximise their choice of varieties with much greater consumer focus.

TECHNOLOGY TRANSFER

Presentations were given at HDC open days at Warwick HRI Wellesbourne on 22 January 2009 and at Duxford Hotel, Duxford on 3 June 2009. An article 'Driving Desire' has featured in HDC News (No. 154, June 2009). Key industry representatives were involved in a project review meeting at Warwick HRI Wellesbourne on 2 April 2009.

Appendices

Appendix 1 Consumer Recruitment Questionnaire

SCREENING QUESTIONNAIRE
PROJECT – SD809 Poinsettia   **RN#:** ....

Respondent Name: ....Map?: ....

Address: ....DBase#: ....

....SD Test ID#:

....

Tel. No. Day: ....   Evening: ....

Date of session1: 3rd December   Time: 11.30, 1, 2.30, 4, 5.30, 7

Date of session2: 4th December   Time: 11.30, 1, 2.30, 4, 5.30, 7

RECRUITER: RECORD ALL CLOSURES IN RECRUITMENT QUESTIONS BY CIRCLING THE
NEXT AVAILABLE NUMBER IN THE APPROPRIATE BOX. RECORD ONLY ONE CLOSURE PER
RESPONDENT. REUSE QUESTIONNAIRE UNTIL YOU REACH A QUALIFIED CONSUMER.

SAY: Good morning/afternoon/evening. My name is .... from Sensory
Dimensions. I am asking some questions about the products people buy and use and I
would like your help. OR May I please speak with someone in the household over the age of
18.

Q1. Which of the following ages groups do you belong to: (CIRCLE AND CHECK QUOTA)
         24 and under   CLOSE
         25-39   1   QUOTA= 30%
         40-65+   2   QUOTA= 70%

Q2. Gender: (CIRCLE AND CHECK QUOTA)
         Male   1   QUOTA= 30%
         Female   2   QUOTA= 70%

Q4. We are interested in talking to people in certain occupation groups. Do you, or does
anyone in your household work for any of the following: (READ LIST. CIRCLE ALL THAT
APPLY)

         Marketing   1
         Public relations   2
         Advertising   3
         Journalism   4
         Manufacturer, retailer or wholesaler of horticultural products 5

(CLOSE IF ANY OF THE ABOVE ARE CIRCLED. CIRCLE NEXT AVAILABLE NUMBER BELOW
AND REUSE QUESTIONNAIRE. OTHERWISE CONTINUE)

1	2	3	4	5	6	7	8	9

Q5. Do you have any allergies or sensitivities that you are aware of?

       Yes   1
       No   2

(IF 2 CONTINUE. IF 1 ASK:)
       What are you allergic to? ....

CLOSE IF HAYFEVER OR PLANTS. CIRCLE NEXT AVAILABLE NUMBER BELOW AND REUSE QUESTIONNAIRE. OTHERWISE CONTINUE)

Q6. What is the occupation of the chief wage earner?

_____

The following to be completed:

ABC1   1
C2DE   2

Q7. Which of the following products do you purchase at least 4 times per year? (READ LIST. CIRCLE ALL THAT APPLY)

       Clothing   1
       Pot Plants/ Flowers   2
       Spirits e.g. whisky rum   3
       Perfume   4
       Hair Colouring   5

(CLOSE IF 2 IS NOT CIRCLED. CIRCLE NEXT AVAILABLE NUMBER BELOW AND REUSE QUESTIONNAIRE. OTHERWISE CONTINUE)

1	2	3	4	5	6	7	8	9

Q8. You mentioned you purchase pot plants/flowers. Which of the following types of pot plants are you aware of? (READ LIST. CIRCLE ALL THAT APPLY)

       Rose   1
       African Violet 2
       Poinsettia   3
       Amaryllis   4
       Orchids   5
       Rubber Plant 6
       Cactus   7

(CLOSE IF 3 IS NOT CIRCLED. CIRCLE NEXT AVAILABLE NUMBER BELOW AND REUSE QUESTIONNAIRE. OTHERWISE CONTINUE)

1	2	3	4	5	6	7	8	9

Q9. You mentioned you are aware of poinsettias. Do you normally purchase them?

       Yes   1 QUOTA MIN 50%   CONTINUE TO Q10 and Q11
       No   2   CONTINUE TO INVITE

Q10. Where do you normally buy poinsettias (READ LIST. CIRCLE ONE)?

       Supermarket   1
       Please record name of supermarket: _____
       Garden Centre   2
       Please record name of garden centre:_____
       Retail Outlet   3
       Florist   4

Q11. How often do you normally buy poinsettias (READ LIST. CIRCLE ONE)?

Every year	1
Every Other Year	2
Less Frequently	3

SAY:
- We are conducting a consumer test on Poinsettias and would like to invite you to take part
- You would need to attend 1 testing session lasting 1 hour
- The session will be held at Sensory Dimensions in the Science and Technology Centre on 3rd or 4th of December
- After completing the session you will receive £10

Are you willing to take part in the study?   Yes   1

                                                    No   2

(CLOSE IF NO. CIRCLE NEXT AVAILABLE NUMBER BELOW AND REUSE QUESTIONNAIRE. OTHERWISE CONTINUE. ARRANGE TIME AND DATE WITH CONSUMER. ASK IF THEY NEED A MAP, IF SO TICK MAP ON FRONT PAGE)

1	2	3	4	5	6	7	8	9

IF THE RESPONDENT AGREES TO PARTICIPATE, INFORM THEM OF THE FOLLOWING GUIDELINES:
- Emphasise how important it is that they attend. Ask them to phone Sensory Dimensions on:
  0118 935 7037 if for any reason they need to cancel their appointment
- Ask them to make a note of the date and time in their diary
- Not to eat, drink or smoke for at least half an hour prior to the test. Plus smoking is not permitted during the test.
- Not wear any fragranced products (e.g. perfumes/aftershaves) that would introduce aromas other than that from food into the test
- To bring reading glasses if needed

FINALLY ASK:
We keep details of all consumers who take part in our testing, do you give permission for us to put you onto our database so we can re-contact you for future tests?   Yes   1

                                                    No   2

Interviewer: ....   *Date of Interview:* ....
....

Appendix 2. Consumer Product Questionnaire, Attitudinal Exit Questionnaire and Verbatim instructions

SD809 Poinsettia CLT
Product Questionnaire

OVERALL APPEARANCE OF THIS PLANT
Q1. Taking everything into consideration please indicate by marking the appropriate box how much you **like this plant overall.**

Dislike Extremely	dislike very much	dislike moderately	dislike slightly	neither like nor dislike	like slightly	like moderately	like very much	like extremely
1	2	3	4	5	6	7	8	9

Q2. How much do you like the **overall shape** of this plant?

Dislike Extremely	dislike very much	dislike moderately	dislike slightly	neither like nor dislike	like slightly	like moderately	like very much	like extremely
1	2	3	4	5	6	7	8	9

Q3. Thinking about the overall height of this plant in relation to its pot what do you think about **the height**?

Much too short	slightly too short	just about right	slightly too tall	much too tall
1	2	3	4	5

Q4. Thinking about the **balance of shape** from all angles, of this plant how **balanced** do you find it?

very unbalanced	slightly unbalanced	well balanced	very well balanced
1	2	3	4

APPEARANCE OF THE 'FLOWERS'
Q5. Now looking just at the flower 'heads' how much do you **like the overall appearance**?

Dislike Extremely	dislike very much	dislike moderately	dislike slightly	neither like nor dislike	like slightly	like moderately	like very much	like extremely
1	2	3	4	5	6	7	8	9

Q6. Thinking more about the red colour of the flower heads how would you rate the **depth of colour** of the bracts?

Much too pale	slightly too pale	just about right	slightly too dark	much too dark
1	2	3	4	5

Q7. Now looking at the buds (cyathia) at the centre of the flower heads how well do you think they **stand out**?

Don't Stand out At all enough	don't stand out quite enough	just about right	stand out slightly too much	stand out far too much
1	2	3	4	5

Q8. Looking at the **shape** of the individual coloured bracts of the flower heads how would you rate the **'spikiness' of their shape**?

Not at all Spiky enough	Not quite spiky enough	just about right	slightly too spiky	much too spiky
1	2	3	4	5

Q9. What do you think about the **size of the flower heads**?

Much too small	slightly too small	just about right	slightly too big	much too big
1	2	3	4	5

Q10. What do you think about the position of the flower heads in this plant?

Much too Spread out	Slightly too spread out	just about right	Slightly too many at top	Far too many at the top
1	2	3	4	5

GREEN FOLIAGE

Q11. Now looking at the green leaves of the plant how much do you **like the overall appearance of the foliage?**

Dislike Extremely	dislike very much	dislike moderately	dislike slightly	neither like nor dislike	like slightly	like moderately	like very much	like extremely
1	2	3	4	5	6	7	8	9

Q12. How would you rate the **depth of colour of the leaves**?

Much too pale	slightly too pale	just about right	slightly too dark	much too dark
1	2	3	4	5

Q13. How would you rate the **density of growth of leaves / foliage** on this plant?

Much too dense	slightly too dense	just about right	slightly too open	much too open
1	2	3	4	5

LIKELIHOOD OF PURCHASE

Q14. How likely would you be **to purchase** this plant if the price was comparable to other plants of its type and size to …

        a) use in your own home?

Definitely Would not buy	Probably would not buy	not sure whether would buy or not	Probably would buy	Definitely would buy
1	2	3	4	5

        b) give to someone else as a gift?

Definitely Would not buy	Probably would not buy	not sure whether would buy or not	Probably would buy	Definitely would buy
1	2	3	4	5

SD809 Poinsettia CLT
Exit Questionnaire

Listed below are some opinions that consumers have previously given about Poinsettia plants.
Please indicate how much you agree or disagree with them by checking the appropriate box for each one.

Completely Disagree 1	Moderately Disagree 2	Slightly Disagree 3	Neither agree Nor disagree 4	Slightly Agree 5	Moderately Agree 6	Completely Agree 7

Poinsettia plants ….

Q1. Do not come in any colour except red

Q2. Provide a versatile gift

Q3. Are difficult to keep looking healthy

Q4. Are an essential part of the Christmas decorations

Q5. Provide good value for money

Q6. Are most suitable to give as a gift to an elderly person

Q7. Do not look good with modern décor

Q8. Have a stylish look

Q9. Make an attractive present for a younger person

Q10. Are only needed for use at Christmas time

SD809 Poinsettia CLT

Points for Consumer Instructions

Assessment

- 12 plants to be assessed.
- Short Usage & Attitude questionnaire to complete at the end.
- Select a coded plant from the table in the centre of the room according to the order that the codes are shown on your computer screen.
- Please check that the code on the plant matches that on the screen at the start of each assessment.
- For each assessment place the plant in your booth and stand back to get an overall impression before you start to complete the questionnaire.
- Written instructions will come up on the screen to guide you through the questionnaire.
- If you have any queries the staff are here to help you.
- Please **take care when handling the plants** to avoid damaging them.
- Place the plant back on the table in the relevant coded area when you have completed its assessment.
- Progress through all assessments in this way.

Definition of terminology … demonstrate using a plant as part of the introduction.

- Bracts … coloured 'leaves' surrounding the buds (cyathia) in the centre.
- Buds (cyathia) … yellowish looking cluster at the centre of the bracts. The cyathia are the <u>real</u> flowers.
- 'Flower heads' … bracts + buds
- Foliage … green leaf area

Appendix 3 Sensory Assessment form

NAME:_____**PRODUCT CODE:**_____**REP:**___

DIMENSION   **SCALE**
OVERALL BALANCE

Ratio Plant Width to Height

BALANCED   UNBALANCED

Ratio Plant Height to Pot

Unbalanced SHORT   BALANCED   UnbalancedTALL

DIMENSION
HEADS

Shape of Head

FLAT   LAYERED

Depth of Red Colour

PALE   DARK

Brightness of Red Colour

NONE   VERY

Variation of Colour across Bracts

NONE   VERY

Indentations of Bract Edge

NONE   VERY

Prominence of Veins

NOT   VERY

Depth Colour of Veins

PALE   DARK

Overall Uniformity Bract Star Growth

NOT UNIFORM   VERY UNIFORM

DIMENSION **SCALE**
HEADS CONT'D

Underdeveloped bract Stars

NONE   MANY

Number of Bract Leaves per head

FEW   MANY

Developed Bract Width

NOT WIDE   VERY WIDE

No. partially Coloured Bracts

NONE   MANY

Smoothness of Bract Surface

NOT SMOOTH   VERY SMOOTH

Petiole Depth of Colour

PALE   DARK

Petiole Length

SHORT   LONG

Staggering of Heads Position

NONE   VERY

Number of Heads

FEW   MANY

Contrast of Heads with Leaves

LOW   HIGH

NAME:_____**PRODUCT CODE:**_____**REP:**___

**DIMENSION
CYATHIA**
								SCALE

Prominence of Cyathia

[scale boxes]

NOT														VERY

Depth Colour Cyathia

[scale boxes]

PALE														DARK

Openess of Cyathia

[scale boxes]

NONE														VERY

Amount of Absycision

[scale boxes]

NONE														HIGH

Number of Cyathia

[scale boxes]

FEW														MANY

Overall Size of Cyathia

[scale boxes]

SMALL														LARGE

**DIMENSION
LEAVES / FOLIAGE**

Top Leaf Depth of Green Colour

[scale boxes]

PALE														DARK

Top Leaf Brightness of Green Colour

[scale boxes]

NONE														VERY

Variation of Colour across Leaves

[scale boxes]

NONE														VERY

DIMENSION   **SCALE**
LEAVES / FOLIAGE CONT'D

Indentations of Leaf Edge

NONE   VERY

Prominence of Veins

NOT   VERY

Depth Colour of Veins

PALE   DARK

Under Leaf Depth of Colour

PALE   DARK

Smoothness of Leaf Surface

NOT SMOOTH   VERY SMOOTH

Petiole Depth of Colour

PALE   DARK

Petiole Length

SHORT   LONG

Developed Leaf Width

NOT WIDE   VERY WIDE

Overall Uniformity of Leaf Size

NOT UNIFORM   VERY UNIFORM

Denseness of Leaf Growth

NOT DENSE   VERY DENSE

NAME:_____**PRODUCT CODE:**_____**REP:**____

DIMENSION   **SCALE**
OVERALL PLANT STRUCTURE

Amount Total Leaf Area

LOW   HIGH

Amount Secondary Growth

LOW   HIGH

Number of Stems

FEW   MANY

Overall Stem Thickness

VERY THIN   VERY THICK

Internodal Length

SHORT   LONG

Bareness of Ankle

LOW   HIGH

Angle / Inclination of leaves

DOWNWARDS   FLAT   UPWARDS

Overall Turgidity of Plant

LOW   HIGH

_____

LOW   HIGH

_____

LOW   HIGH

_____

LOW   HIGH

Consumer Mean Scores Table

	1B	2C	3A	4C	5E	6F	7I	8P	9P	10T	11V	12D	LSD	Prob
Overall Liking	5.99	7.01	4.68	4.47	6.01	6.54	7.45	5.90	5.98	5.33	6.33	4.88	0.46	<.0001
Shape Liking	5.95	6.82	4.60	4.30	5.99	6.68	7.38	6.01	5.91	6.31	6.16	4.56	0.45	<.0001
Height JR	3.81	3.41	3.42	3.59	3.85	3.04	2.92	2.37	3.08	2.91	3.60	3.89	0.14	<.0001
Balance	2.64	3.13	2.47	1.97	2.82	3.30	3.25	2.98	2.52	2.79	2.59	1.96	0.22	<.0001
Overall liking appearance of bract stars	6.31	6.80	4.88	4.87	5.96	6.74	7.17	5.59	5.95	6.09	6.63	5.52	0.41	<.0001
Depth of Colour of Flower Heads JR	2.81	2.94	2.92	2.88	3.39	2.63	2.94	2.80	2.82	2.58	2.85	2.95	0.13	<.0001
Buds Stand Out	2.14	2.84	2.44	2.25	2.98	2.84	2.75	2.22	2.77	2.34	3.00	2.84	0.15	<.0001
Spikiness of Coloured Bracts JR	2.99	3.08	3.37	3.45	2.91	2.87	2.99	2.60	2.90	2.66	2.82	3.13	0.15	<.0001
Size of Flower Heads JR	3.04	3.36	2.63	2.97	3.21	3.53	3.33	3.83	2.94	2.95	3.23	2.98	0.16	<.0001
Flower Head Positon	1.92	1.84	1.80	1.96	1.90	1.91	1.94	1.98	1.84	1.98	1.88	1.84	0.11	0.0132
Spread of Flower Heads Throughout Plant JR	3.40	3.34	3.59	3.66	3.16	3.42	3.16	3.16	2.99	2.97	3.20	3.53	0.19	<.0001
Overall Liking of Appearance of Foliage	6.28	6.77	5.28	5.19	5.95	6.05	6.82	5.54	5.89	4.88	6.33	5.66	0.42	<.0001
Depth of Colour of Leaves JR	2.97	2.84	3.20	2.94	3.22	2.70	3.15	2.89	2.96	1.94	2.85	2.94	0.14	<.0001
Density of Growth JR	3.27	3.02	3.04	3.38	3.11	2.80	2.98	2.89	3.20	3.10	3.20	3.59	0.18	<.0001
Purchase Intent A use in your own home?	3.04	3.73	2.34	2.16	3.05	3.38	3.98	2.88	3.00	2.66	3.17	2.34	0.28	<.0001
Purchase Intent B give to someone else as a gift?	3.11	3.76	2.31	2.13	3.03	3.44	4.02	2.91	3.00	2.68	3.26	2.41	0.29	<.0001

Appendix 5 Table of Cluster sensory attribute correlation table

Label	Correlation Coefficients				p-Values			
	All	Cluster1	Cluster2	Cluster3	All	Cluster1	Cluster2	Cluster3
Ratio Plant Width to Height	0.47	**0.60**	0.38	-0.15	0.1240	0.0404	0.2245	0.6523
Ratio Plant Height to Pot	0.27	0.34	0.18	0.00	0.3963	0.2791	0.5687	0.9905
Shape of Head	**-0.51**	**-0.71**	-0.31	0.01	0.0875	0.0090	0.3264	0.9658
Depth of Red Colour	-0.07	-0.45	0.03	0.41	0.8244	0.1451	0.9248	0.1872
Brightness of Red Colour	0.12	0.38	-0.04	-0.11	0.7183	0.2263	0.9104	0.7290
Variation of Colour across Bracts	**-0.55**	-0.37	**-0.56**	-0.10	0.0667	0.2417	0.0577	0.7657
Indentations of Bract Edge	-0.26	-0.34	-0.24	0.16	0.4117	0.2747	0.4551	0.6129
Prominence of Veins	0.49	-0.10	**0.61**	**0.56**	0.1040	0.7604	0.0353	0.0572
Depth of Colour of Veins	0.45	-0.14	**0.51**	**0.69**	0.1452	0.6724	0.0910	0.0123
Overall Uniformity Bract Star Growth	**0.53**	**0.56**	0.45	-0.01	0.0743	0.0585	0.1444	0.9856
Underdeveloped Bract Stars	-0.28	-0.37	-0.29	0.26	0.3760	0.2342	0.3594	0.4149
Number of Bract Leaves per head	0.28	0.30	0.38	-0.39	0.3861	0.3364	0.2176	0.2126
Developed Bract Width	**0.67**	**0.59**	**0.55**	0.21	0.0181	0.0457	0.0653	0.5107
No. partially Coloured Bracts	-0.29	-0.44	-0.27	0.27	0.3538	0.1538	0.3970	0.3886
Smoothness of Bract Surface	**0.55**	**0.57**	0.38	0.19	0.0657	0.0509	0.2283	0.5537
Petiole Depth of Colour	0.05	-0.48	0.18	**0.56**	0.8847	0.1119	0.5734	0.0601
Petiole Length	-0.24	0.11	-0.34	-0.25	0.4584	0.7403	0.2738	0.4298
Staggering of Head Position	-0.17	**-0.52**	-0.02	0.28	0.5972	0.0839	0.9564	0.3839
Number of Primary Heads	-0.15	0.01	-0.11	-0.32	0.6396	0.9806	0.7420	0.3032
Number of Secondary Heads	0.17	-0.25	0.26	0.43	0.5976	0.4318	0.4093	0.1593
Contrast of Heads with Leaves	-0.07	0.33	-0.37	0.04	0.8240	0.2971	0.2414	0.8896
Prominence of Cyathia	-0.12	-0.04	-0.05	-0.25	0.7179	0.8909	0.8853	0.4329
Depth Colour Cyathia	-0.03	-0.13	0.03	0.04	0.9309	0.6851	0.9179	0.9123
Openess of Cyathia	0.05	0.20	0.11	-0.40	0.8689	0.5331	0.7332	0.2036
Amount of Absycision	0.19	0.37	0.28	**-0.58**	0.5609	0.2357	0.3809	0.0480
Number of Cyathia	-0.22	-0.20	-0.25	0.12	0.4937	0.5256	0.4291	0.7138
Overall Size of Cyathia	-0.07	0.13	-0.14	-0.14	0.8384	0.6862	0.6674	0.6694
Top leaf Depth of Green Colour	0.15	-0.40	0.42	0.23	0.6335	0.2034	0.1690	0.4640
Top Leaf Brighness of Green Colour	0.07	**0.57**	-0.31	0.03	0.8315	0.0506	0.3215	0.9205
Variation of Colour across Leaves	-0.32	0.29	**-0.52**	-0.46	0.3078	0.3541	0.0803	0.1366
Indentations of Leaf Edge	0.13	0.16	0.03	0.16	0.6769	0.6087	0.9295	0.6251
Prmoinence of Veins	0.32	-0.07	0.41	0.31	0.3165	0.8396	0.1814	0.3209
Depth Colour of Veins	0.16	0.28	-0.06	0.28	0.6139	0.3860	0.8604	0.3812
Under leaf Depth of Colour	0.37	-0.13	**0.50**	0.40	0.2426	0.6763	0.0959	0.1936
Smothness of Leaf Surface	0.43	-0.13	**0.62**	0.36	0.1612	0.6793	0.0299	0.2509
Petiole Depth of Colour	0.23	0.19	0.03	0.45	0.4772	0.5507	0.9247	0.1383
Petiole Length	-0.10	0.13	-0.34	0.20	0.7586	0.6808	0.2845	0.5315
Developed Leaf Width	0.36	**0.53**	0.11	0.20	0.2471	0.0735	0.7345	0.5400
Overall Uniformity of Leaf Size	**0.76**	**0.70**	**0.64**	0.15	0.0042	0.0109	0.0258	0.6405
Denseness of Leaf Growth	0.40	0.31	0.45	-0.08	0.2012	0.3346	0.1458	0.7964
Amount of Total Leaf Area	0.44	0.29	0.35	0.31	0.1559	0.3620	0.2605	0.3257
Amount of Scondary Growth	-0.07	-0.31	0.09	0.05	0.8310	0.3257	0.7781	0.8826
Number of Stems	0.00	-0.09	0.04	0.04	0.9898	0.7733	0.8931	0.9068
Overall Stem Thickness	0.19	-0.10	0.34	0.07	0.5610	0.7523	0.2819	0.8307
Internodal Length	-0.47	**-0.61**	-0.49	0.41	0.1187	0.0352	0.1033	0.1813
Bareness of Ankle	**-0.56**	**-0.60**	-0.46	0.02	0.0602	0.0374	0.1337	0.9528
Angle/Inclinaton of Leaves	-0.35	**-0.54**	-0.35	0.42	0.2604	0.0698	0.2602	0.1725
Overall Turgidity of Plant	0.08	-0.10	0.04	0.36	0.8024	0.7681	0.8924	0.2530

Coefficient Coloured when p<0.1