

Rockmelon Processing Quality

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Introduction

Considerable export opportunities exist in countries such as Japan, Canada, and Europe (Germany) for peeled rockmelon frozen in quarters or as diced product. Processing of these products is limited because the cost of hand labour for peeling is prohibitive. Consequently, development of mechanical peeling equipment is essential for Australian industry to compete. In this project, appropriate machinery for the production of a high quality product is being developed, and basic studies in food technology, marketing, and production are being carried out.

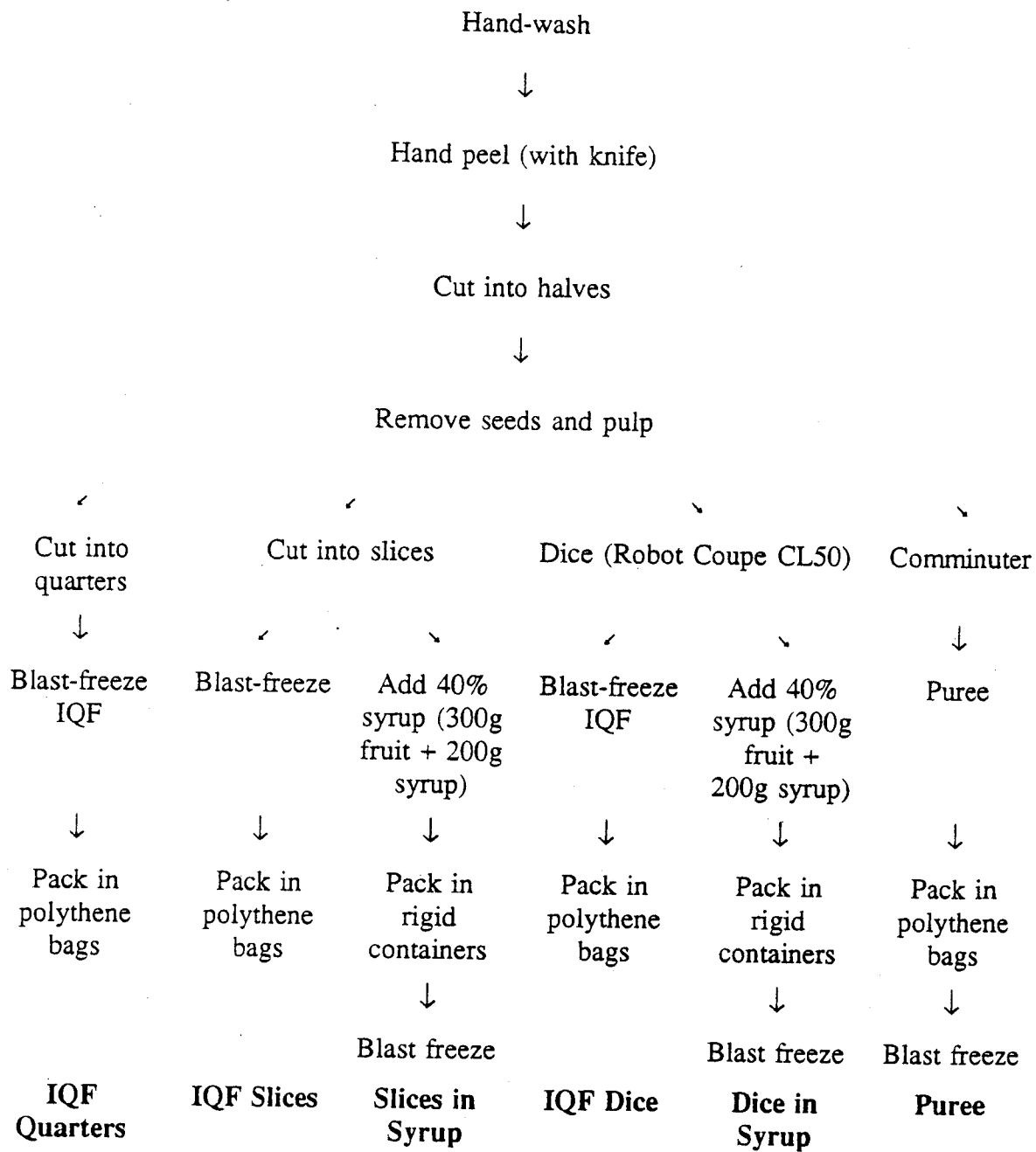
There are no Australian publications on rockmelon freezing, although fresh fruit quality of various cultivars has been investigated (Mutton, 1978). Very little overseas information on freezing rockmelons has been published (del Rio and Miller, 1979 and Martinez-Javega *et al.*, 1975). In this project, the freezing quality of new rockmelon and honeydew melon cultivars was evaluated.

Trial No. 1

Materials and methods

Six rockmelon cultivars were harvested from the DPI Bowen Horticultural Research Station over the period 2 November 1992 to 6 November 1993. Fruit were stored at 7°C prior to processing. The fruit were processed as IQF dice, IQF slices, IQF quarters, slices and dice in syrup and puree. Figure 1 summarises the processing unit operations. Freezing times were determined on melons purchased from the Brisbane markets by inserting thermocouples into the centres of the fruit pieces, and temperatures were recorded with a data logger.

Figure 1: Rockmelon freezing process flow sheet



Quality of the raw fruit was assessed by measurement of size and shape, flesh recovery, flesh thickness, Instron firmness, Hunter Colour, brix, and pH, while the processed fruit was evaluated by sensory assessment. Methodology is summarised below:

pH

Measured on pulped pieces, using a pH meter.

Flesh recovery

$$\text{Percentage recovery} = \frac{\text{Raw weight} - \text{Prepared weight}}{\text{Raw weight}} \times 100$$

Brix

Measured with a refractometer at 20°C, on a pulped sample.

Colour

Measured on a pulped sample, using the Labscan colour meter, and recorded as Hunter L, a and b values (44 mm aperture)

Texture

Measured on pieces, with the Instron Universal Texture Measuring Instrument and Kramer cell (50g sample, load = 1 000 N, crosshead speed = 200 mm/min, chart speed = 200 mm/min, Polarity = A, sensitivity = x10 out). The maximum peak height was recorded.

Sensory assessment (Frozen products)

The frozen products were thawed overnight at 5°C, and then assessed for quality. Appearance, flavour, texture, were rated on nine point hedonic scales, using the "Compusense", computerised taste panel system, with a panel of 24 IFIQ staff.

Results and Discussion

Freezing rate curves are given in graphs AM-069, AM-070, and AM-071. These graphs indicate freezing times of 100 minutes for dice in syrup and 130 minutes for slices in syrup to reach -20°C. Freezing times for IQF packs to reach -20°C were 15 minutes for dice, 45 to 55 minutes for slices, and 70 minutes for quarters. Objective quality assessment data for the six cultivars are given in table 1. Melon shapes ranged from large oval fruit to small and spherical. Flesh recoveries ranged from 56.4% to 62.9% (with hand preparation). Flesh thickness ranged from 20 to 34 mm. Firmness, as measured on an Instron Universal Texture measuring Instrument, ranged from 432 N (softest) to 952N

(firmest). Hunter Colour measurements showed relatively small differences among varieties. Brix levels ranged from 7.5 to 10.6, and pH from 6.1 to 6.54.

Sensory data are given in table 2. In general, IQF dice were given the highest scores for appearance and flavour, while IQF slices had the lowest scores. Texture effects were only slight. Network and Barkly received the highest ratings for sensory quality.

Table 1: Variety trial

Rockmelon processing data

Variety	Malibu	Eastern Star	Hot Shot	Barkly	Y741	Network
Size and Shape	small, slightly oval	medium to large, oval	large, oval	- small - spherical	- medium - spherical	small - slightly oval
Flesh (by hand)						
% Recovery	61.0	57.8	59.6	62.9	62.9	56.4
Flesh Thickness (mm)	24.5 mm	22 mm	34 mm	22.7 mm	22.3 mm	20.0 mm
Instron Firmness						
Peak Height (mm)	135	238	164	108	148	153
Peak Force (N)	540	952	656	432	592	612
Hunter Colour						
L (brightness)	44.80	41.78	43.21	43.63	44.92	40.70
a (redness)	24.81	22.24	21.88	24.72	25.06	26.57
b (yellowness)	25.80	23.06	23.78	23.71	25.62	23.15
Brix	7.5	8.3	9.9	10.1	9.1	10.6
pH	6.19	6.54	6.44	6.31	6.10	6.5

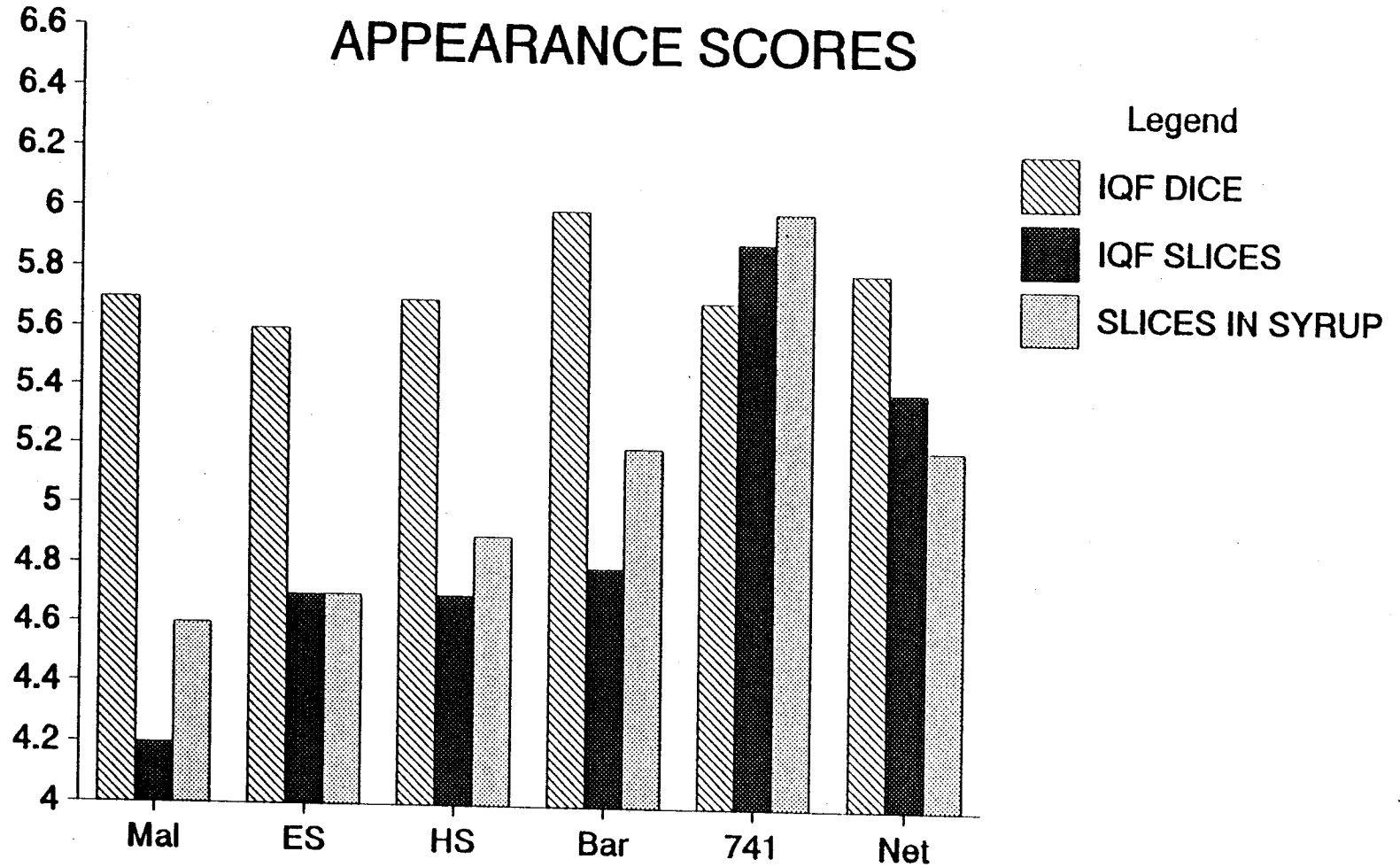
Table 2: Variety trial

Rockmelon sensory data

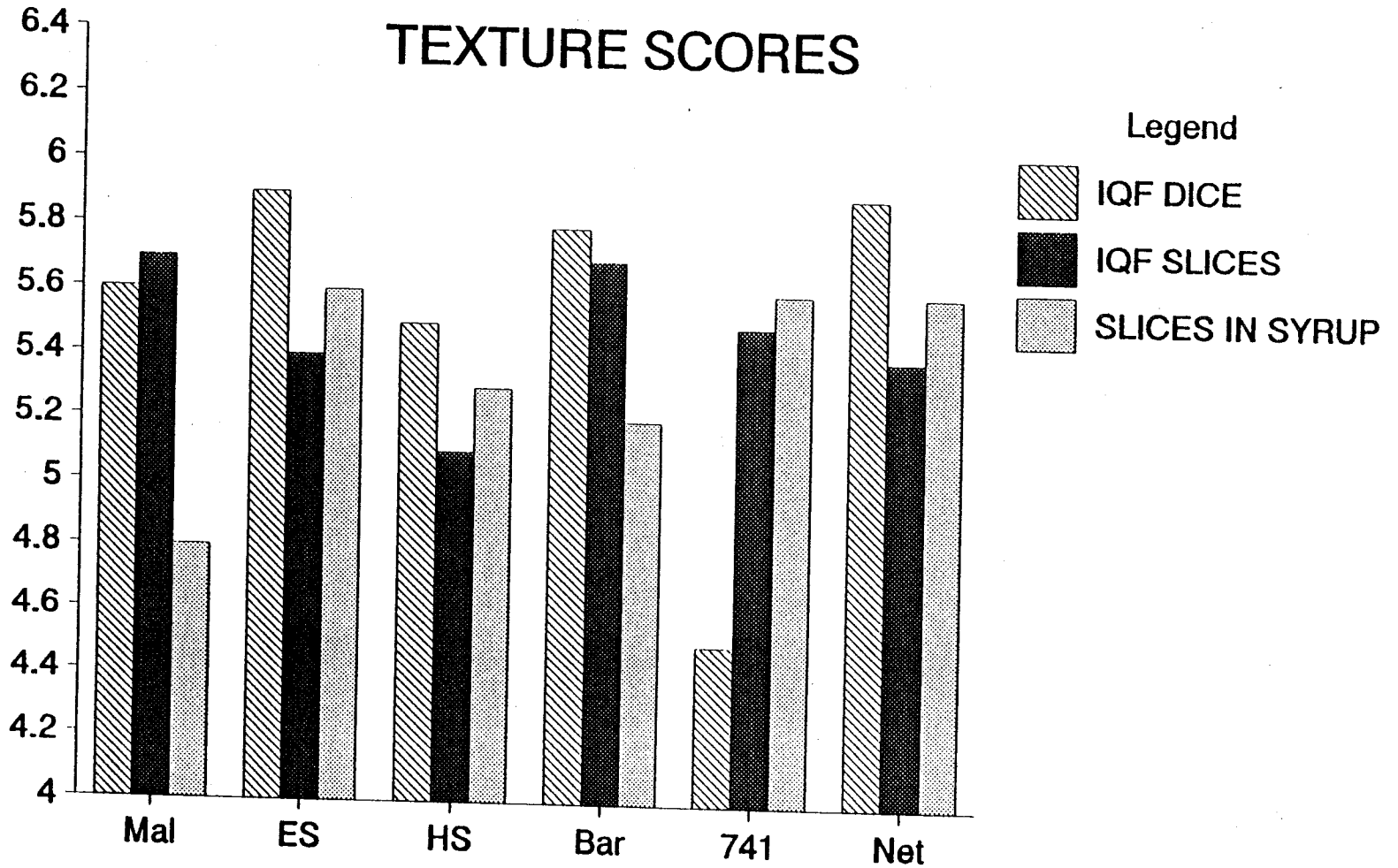
Variety	Malibu	Eastern Star	Hot Shot	Barkly	Y741	Network
<i>Appearance</i>						
Dice (IQF)	5.7	5.6	5.7	6.0	5.7	5.8
Slices (IQF)	4.2	4.7	4.7	4.8	5.9	5.4
Slices in Syrup	4.6	4.7	4.9	5.2	6.0	5.2
<i>Flavour</i>						
Dice (IQF)	5.6	5.8	5.4	6.1	4.2	6.3
Slices (IQF)	4.1	4.8	3.7	5.5	4.2	6.0
Slices in Syrup	4.2	4.9	4.9	6.0	5.7	5.4
<i>Texture</i>						
Dice (IQF)	5.6	5.9	5.5	5.8	4.5	5.9
Slices (IQF)	5.7	5.4	5.1	5.7	5.5	5.4
Slices of Syrup	4.8	5.6	5.3	5.2	5.6	5.6

ROCKMELON FREEZING

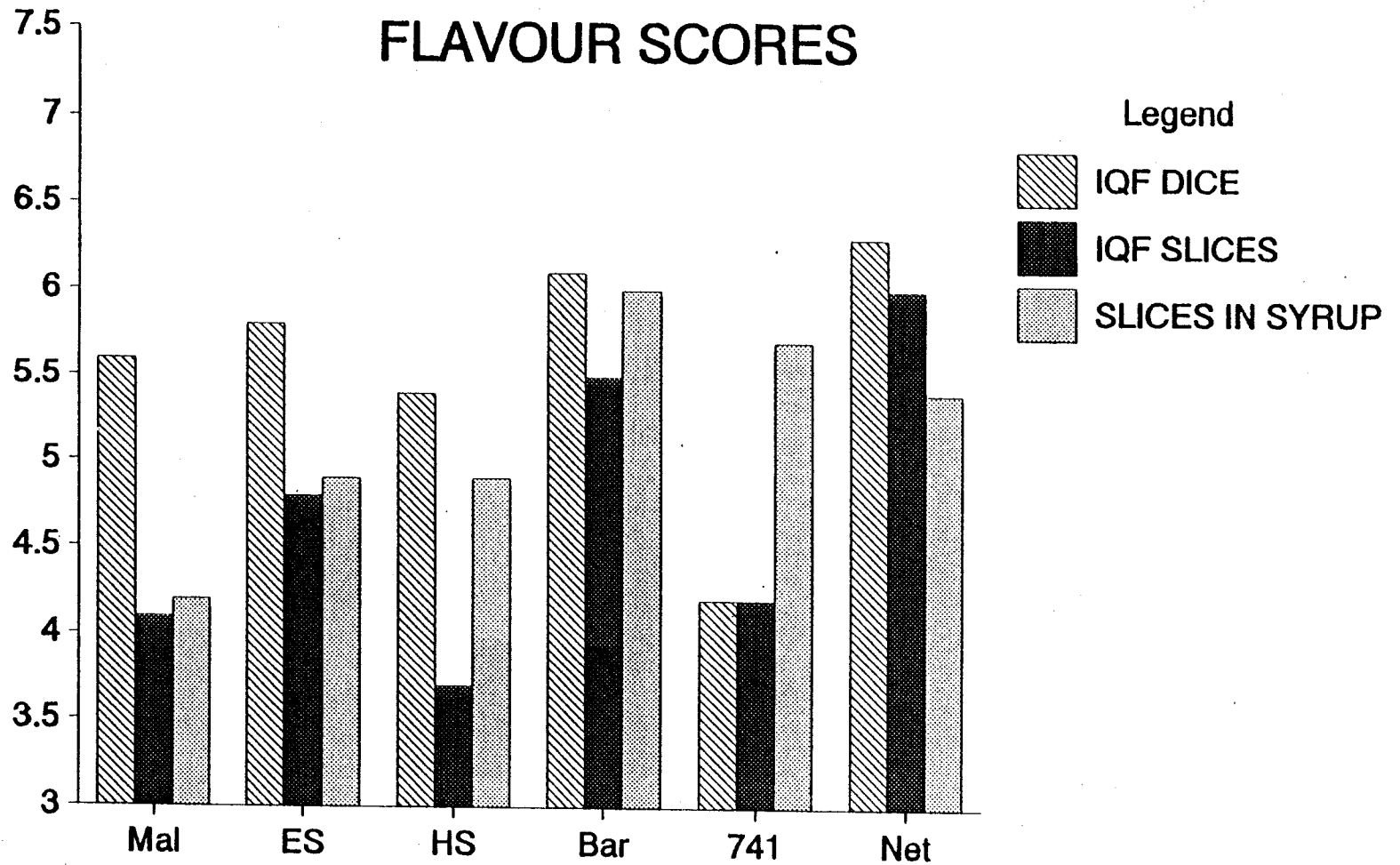
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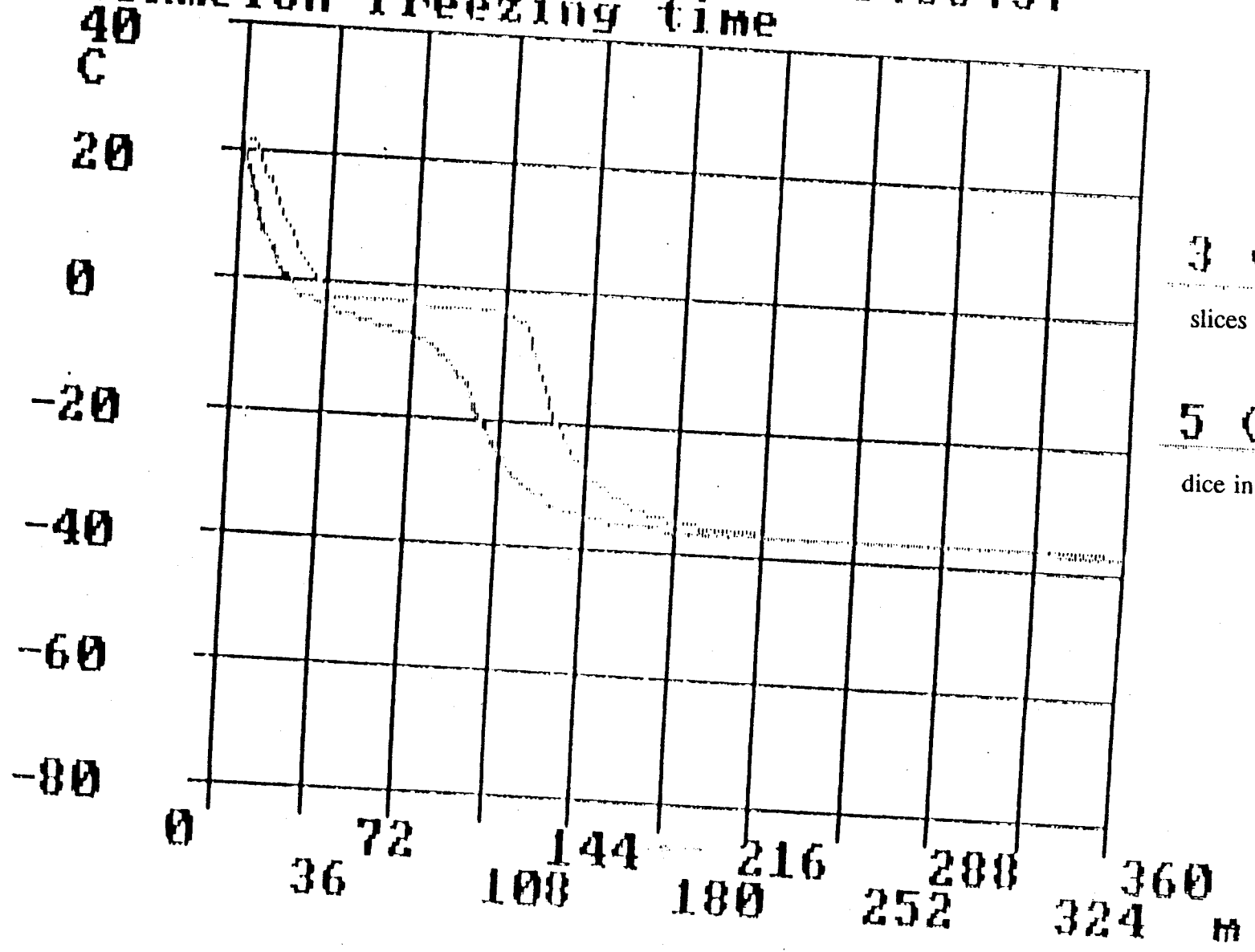
ROCKMELON FREEZING 1992



ROCKMELON FREEZING 1992



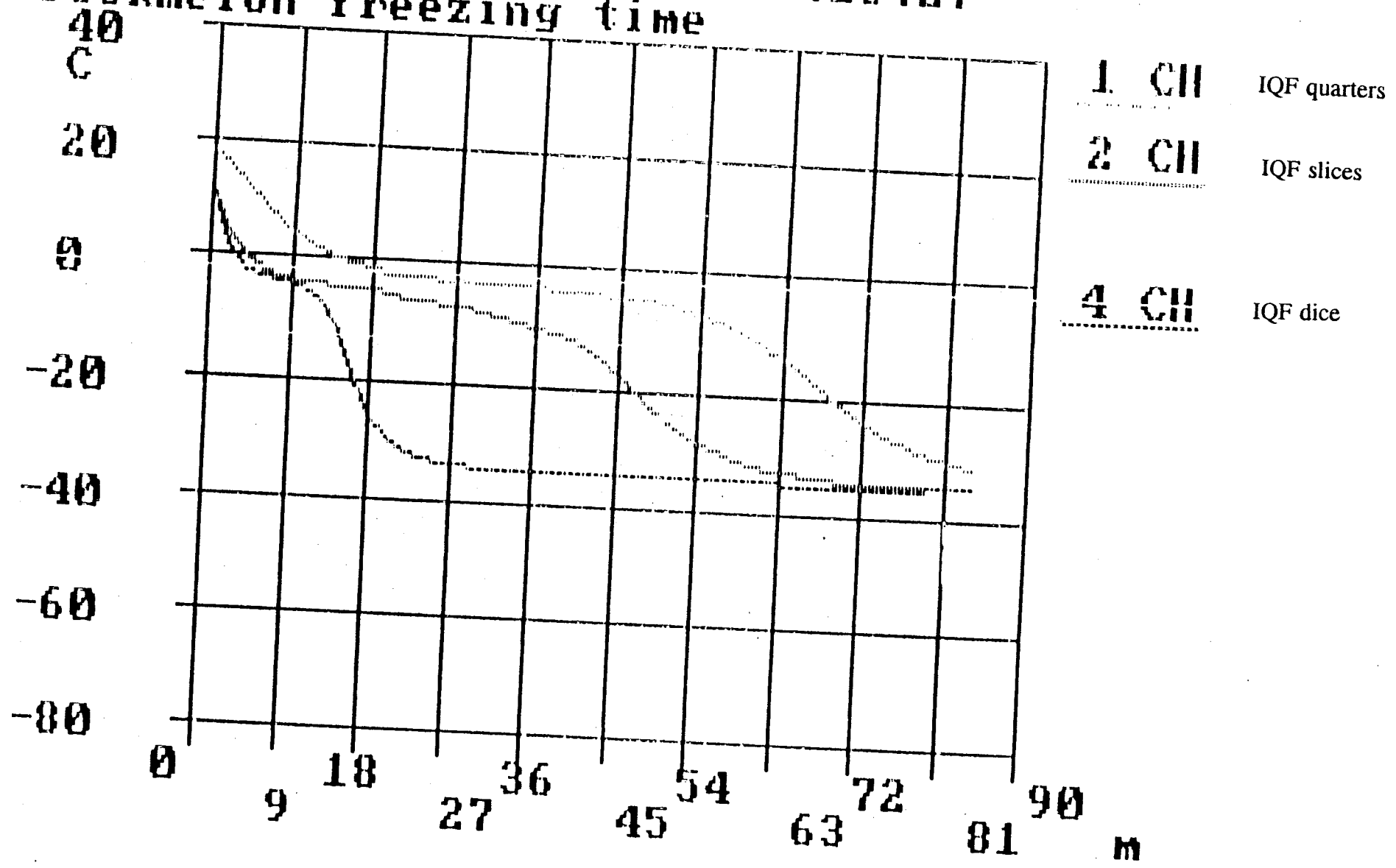
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Rockmelon freezing time



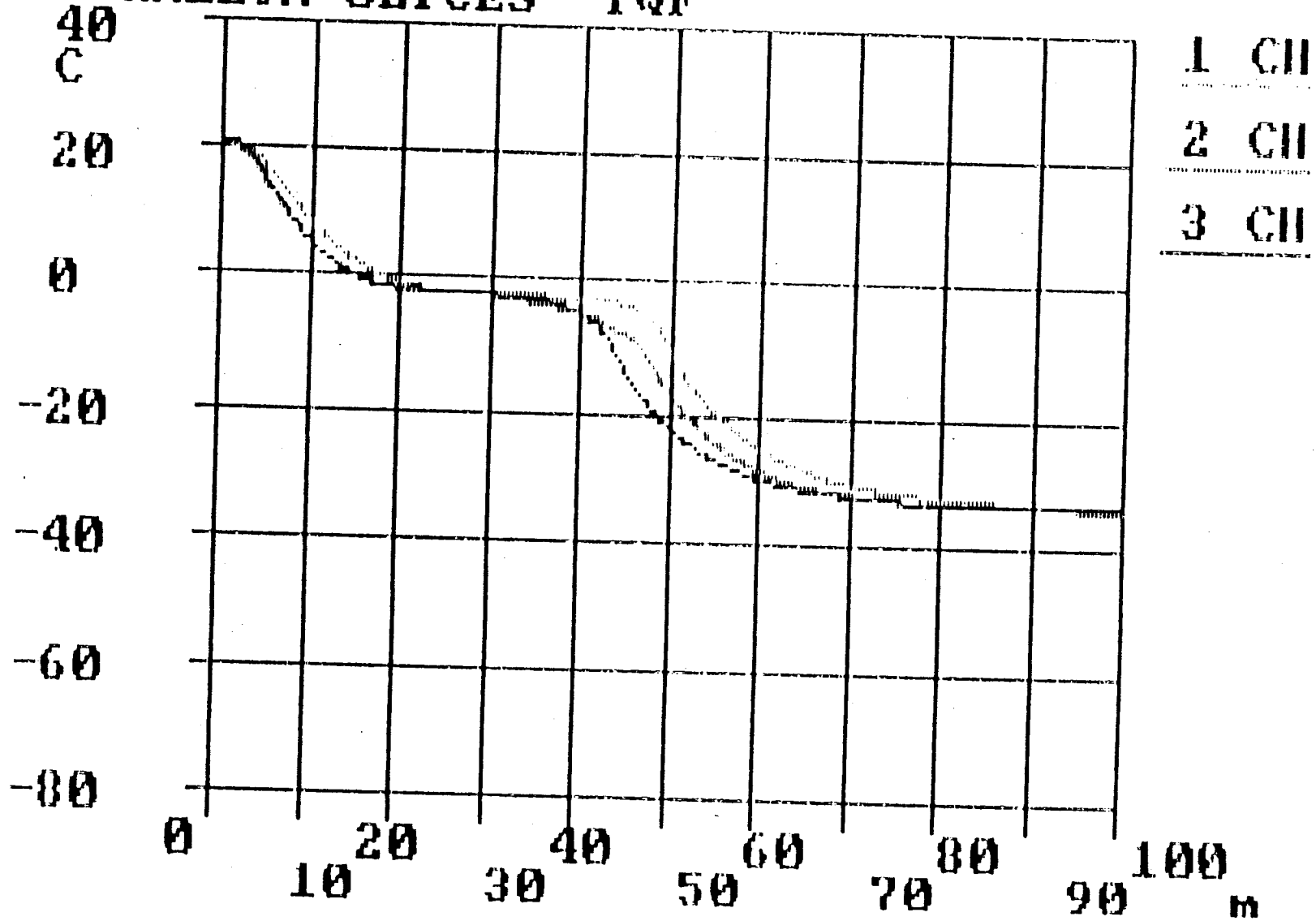
3 CH
slices in syrup

5 CH
dice in syrup

AM-070 INTERVAL 02:00 M.NO. 01
DATE: 23/10/92 TIME: 09:26:27
rockmelon freezing time



AM-071 INTERVAL 00:20 M.NO. 01
DATE: 26/10/92 TIME: 11:18:55
ROCKMELON SLICES IQF



Trial No. 2

Material and methods

Two rockmelon cultivars (Meteor and Eldorado) and two honeydew melon cultivars (Honeymoon and Dewcrisp) were hand harvested from the DPI Bowen Horticultural Research Station in June, 1993. In addition, rockmelons were obtained from the Brisbane markets. All fruit were processed as IQF slices. A sample of a commercial frozen rockmelon product on the Australian market, "Sunnyside" rockmelon balls, was also obtained for assessment.

Quality of raw fruit was assessed by measurement of size and shape, flesh recovery, flesh thickness, Instron firmness, Hunter Colour, brix, and pH. The processed fruit were evaluated by drip loss, Instron firmness, Hunter Colour, brix, pH and sensory assessment.

Results and Discussion

Objective data are presented in table 3. For the rockmelons, Meteor and the market fruit were softer, lighter in colour, and higher in brix and drip loss than Eldorado. The Eldorado melons may not have been fully ripe. The commercial "Sunnyside" rockmelon balls were softer and less bright than Eldorado, but higher in brix. This product had the highest drip loss. The market fruit were the firmest, after freezing.

For the honeydew melons, both varieties became softer after freezing and thawing, Dewcrisp had a brighter colour (higher L value) and lower drip loss than Honeymoon.

Sensory data are summarised in table 4. All scores were low. Eldorado received the lowest appearance and flavour scores of the rockmelon samples. The Commercial "Sunnyside" balls had lower flavour scores than Meteor and the market fruit. Texture ratings were highest for the market fruit and lowest for the commercial product.

Overall, for rockmelons, Meteor was better than Eldorado, but variations in ripeness may have affected this. It is interesting to note the low scores were similar to the scores for the commercial rockmelon balls.

For honeydew melons, Dewcrisp had a better appearance than Honeymoon. Both varieties had a crisp texture and bland flavour, and may not have been ripe enough when frozen.



Sunnyside

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INDIVIDUALLY
QUICK FROZEN**

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STORE AT OR BELOW MINUS 18°C

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Manufacturers and
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THAWING INSTRUCTIONS

Pour required quantity
into a shallow dish or
plate to permit even
thawing. For best
results thaw in a
refrigerator.

Do not refreeze after
thawing.

Table 3: Rockmelon and honeydew melon objective quality data (Winter trial)

Variety *	Meteor (R)	Eldorado (R)	Market Fruit (R)	Sunnyside Balls (R)	Honeymoon (H)	Dewcrisp (H)
Size and shape	small, round	medium to large, oval	medium, oval	-	large, oval	medium to large
Flesh (by hand) % Recovery	53.5	57.9	-	-	62.8	66.6
Flesh Thickness Range (mm)	10-33	25-42	-	-	23-40	16-40
Instron Firmness (N)						
Raw	212	588	-	-	860	892
Frozen	232	792	960	580	720	374
Hunter colour						
L (brightness)						
Raw	54.59	51.08	52.70	-	39.86	45.68
Frozen	49.97	48.50	50.37	47.78	39.20	45.58
a (redness)						
Raw	24.99	24.00	25.79	-	-9.17	-9.23
Frozen	22.80	23.21	25.02	27.48	-9.57	-9.71
b (yellowness)						
Raw	30.07	29.07	29.66	-	21.91	24.79
Frozen	28.15	28.51	29.00	27.59	21.23	23.07
Brix						
Raw	9.1	7.1	9.8	-	8.3	8.3
Frozen	8.5	6.1	10.0	8.2	7.5	8.0
pH						
Raw	6.36	6.42	6.55	-	5.47	5.33
Frozen	6.86	6.62	6.6	6.77	5.40	5.46
% Driploss after thawing	8.83	2.34	3.48	10.76	6.20	5.36

* (R) = rockmelon variety
(H) = honeydew melon variety

Table 4: Sensory data *

Variety	Meteor (R)	Eldorado (R)	Market Fruit (R)	Sunnyside Balls (R)	Honeymoon (H)	Dewcrisp (H)
Appearance	5.4	4.8	5.6	5.3	4.8	5.3
Flavour	4.7	3.0	5.1	3.4	3.8	3.2
Texture	3.8	3.9	4.3	3.0	3.8	3.8

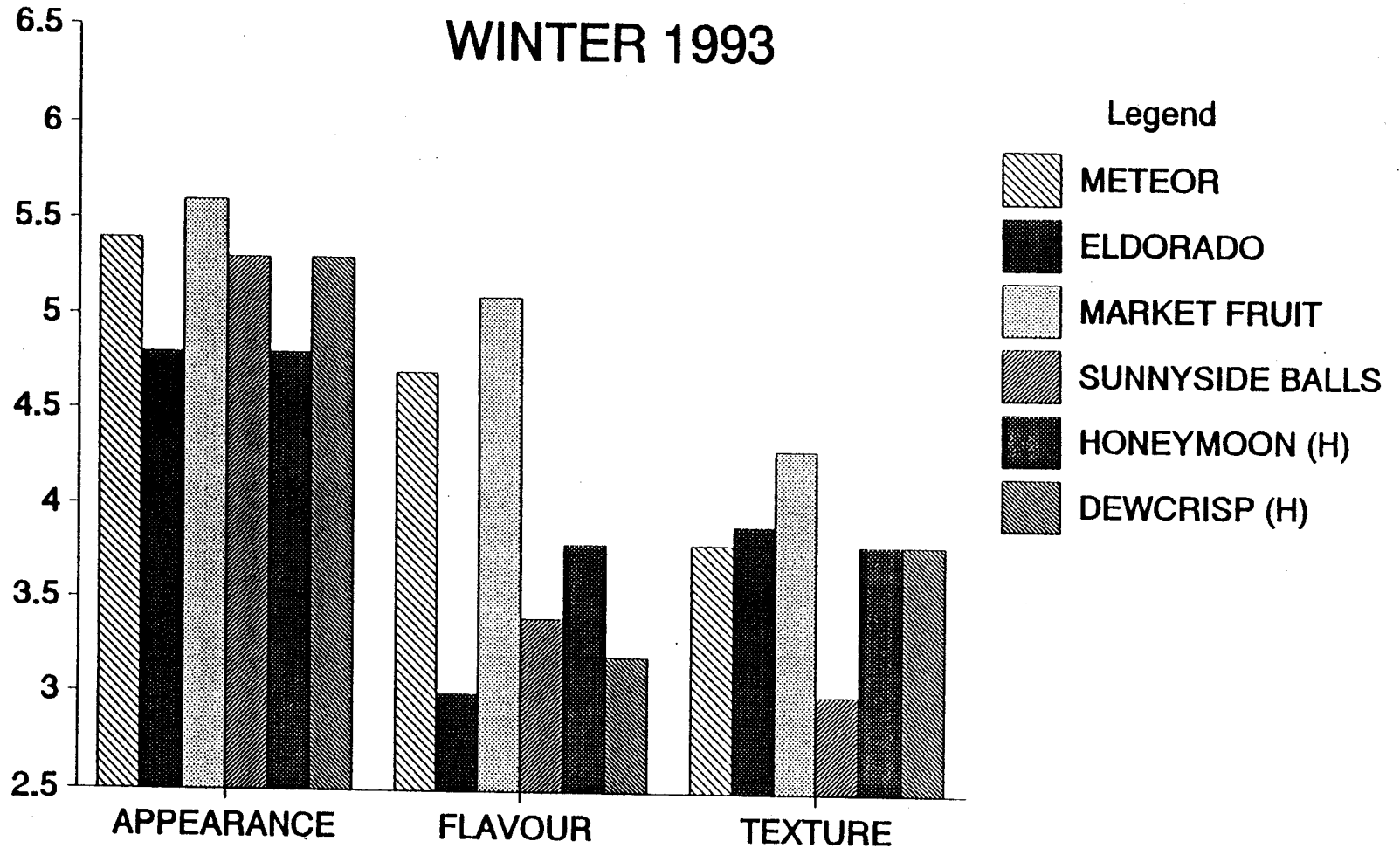
(R) = rockmelon variety

(H) = honeydew melon variety

* Mean scores of 30 tasters (rockmelon) and 27 tasters (honeydew melon)

ROCKMELON FREEZING

WINTER 1993



Material and methods

Ten rockmelon cultivars (B651, Ivanhoe, Eastern Star, Malibu, SPS281, NK462, Network, Hot Shot, Argyle, Sunglow) and two honeydew melon cultivars (Honeymoon and Dewcrisp) were hand harvested from the DPI Bowen Horticultural Research Station in October and November, 1993. In addition, rockmelons were obtained from the Brisbane markets. All fruit were processed as IQF dice. In addition, Honeydew melons were also frozen as dice in 40% syrup.

Quality of raw fruit was assessed by measurement of size and shape, flesh recovery and thickness, Instron firmness, Hunter Colour, brix, and pH. The processed fruit were evaluated by drip loss, Instron firmness, Hunter Colour, brix, pH and sensory assessment.

Results and Discussion

Objective data are for Honeydew melons presented in table 5. Honeymoon was slightly brighter than Dewcrisp, as indicated by a higher L value. Dewcrisp had a higher brix (soluble solids) level than Honeymoon. Other characteristics were similar.

Objective data for unprocessed rockmelons is given in table 6. Fruit ranged from small spherical (e.g. Ivanhoe) to large oval shapes (e.g. Eastern Star). Maximum flesh thickness ranged from 28 mm (SPS281) to 42 mm (Ivanhoe), and minimum flesh thickness from 13 mm (Eastern Star) to 20 mm (B561 and Argyle). Eastern Star had the brightest flesh colour, as shown by its L value. Brix levels were highest in Ivanhoe and Network, and lowest in Malibu, Hot Shot, and B561. pH was highest in SPS281, and lowest in B561.

Table 7 summarises objective data for the frozen diced rockmelon cultivars. Eastern Star and B561 were the firmest samples, and Ivanhoe and Malibu the softest. All trial samples were firmer than the frozen market fruit. Malibu and Argyle had the brightest colour, while Malibu was the reddest and most yellow. Argyle was the least red of the trial samples, but still more red than the market fruit sample.

Brix levels were highest in Ivanhoe and Network, and lowest in Malibu and the market fruit. In most varieties, the brix level in the drip loss during thawing, was slightly less than the brix level of the fruit flesh. pH was highest in Eastern Star, and lowest in Argyle. The pH of the drip after thawing was similar to the fruit flesh pH in most cases.

Sensory data for frozen Honeydew melons are given in table 8. Dewcrisp was scored above Honeymoon for appearance and flavour as IQF dice, and for appearance as dice in syrup. Flavour scores were higher for the syrup packs in both varieties.

Sensory data for frozen rockmelons are given in table 9. Eastern Star received the highest appearance and texture scores. The highest flavour scores went to Sunglow, Eastern Star, SPS281, and Argyle.

All scores were low, which may have been due to very ripe fruit being used for freezing. This may have adversely affected texture and flavour upon thawing, as indicated by the high brix level in the drip loss (causing a drop in sweetness). Seasonality might also have affected these scores.

Table 5: Honey Dew Melons - Objective data

Variety	Raw Honeymoon	Frozen Honeymoon	Raw Dewcrisp	Frozen Dewcrisp
Size and shape	Large, oval		Large, oval	
Hunter Colour				
L	39.56	40.14	35.08	37.09
a	-5.09	-5.33	-5.16	-6.34
b	15.29	16.15	14.05	15.82
Brix	10.5	10.6	11.3	11.0
pH	6.45	6.70	6.44	6.65

Table 6: Rockmelons - Objective data (Raw fruit)

Variety	B561	Ivanhoe	Eastern Star	Malibu	SPS 281	Nk 462	Network	Hot Shot	Argyle	Sunglow
Size and shape	Small Spherical	Small Spherical	Large Oval	Small Oval	Small Oval	Small Oval	Very small Oval	Large Oval	Medium Oval	Medium Oval
Flesh Thickness (mm)										
Max	35	42	31	-	28	35	35	-	37	30
Min	20	15	13	-	14	15	12	-	20	18
Hunter Colour										
L	39.36	40.70	42.49	40.57	39.79	40.05	39.19	40.13	38.95	39.7
a	14.96	17.94	17.93	16.46	17.40	17.15	17.44	17.09	16.62	15.01
b	19.92	20.81	21.63	20.70	20.42	20.61	20.11	20.53	19.15	19.67
Brix	8.8	10.2	9.2	8.3	9.1	9.5	10.3	8.8	9.7	9.7
pH	6.75	6.85	6.93	6.9	7.08	6.95	6.93	6.9	6.7	6.89

Table 7: Rockmelons - Objective Data (Frozen)

Test	B561	Ivanhoe	Eastern Star	Malibu	SPS 281	NK 462	Net Work	Hot Shot	Argyle	Sunglow	Market Fruit
Instron (N)	900	448	1000	488	572	548	620	504	520	776	340
Hunter Colour											
L	41.68	39.20	41.86	43.83	40.13	40.26	40.15	40.50	43.34	41.43	40.75
a	20.55	20.61	19.54	21.12	19.70	19.48	21.44	20.46	17.83	20.14	16.59
b	22.97	21.11	22.24	23.42	21.35	21.67	21.94	21.80	22.83	22.48	21.63
Fruit pH	7.2	7.0	7.4	6.5	7.0	7.2	6.9	6.9	6.2	6.8	6.4
Drip pH	7.4	7.0	7.0	6.8	6.8	6.8	7.0	6.7	6.9	7.0	6.7
Fruit brix	9.1	10.9	9.3	8.4	9.2	9.8	10.1	9.1	9.7	9.7	7.1
Drip brix	9.0	10.4	8.7	8.4	8.7	9.7	9.5	7.9	9.6	9.2	7.2

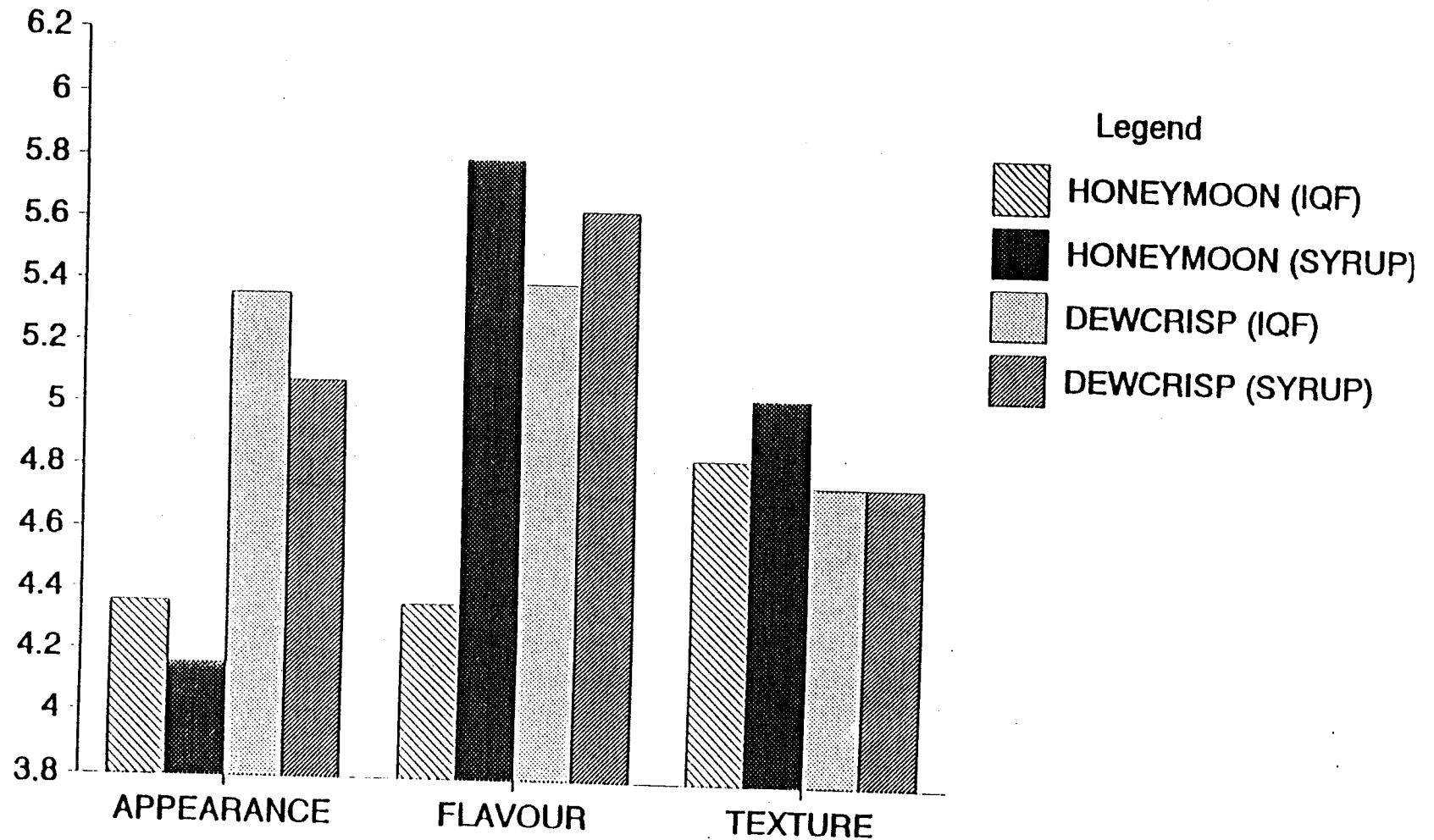
Table 8: Frozen Honeydew Melon Varieties - Sensory Data

Variety	Appearance	Flavour	Texture
Honeymoon (IQF)	4.4	4.4	4.7
Dewcrisp (IQF)	5.4	5.4	4.8
Honeymoon (syrup)	4.2	5.8	5.0
Honeymoon (syrup)	5.1	5.5	4.8

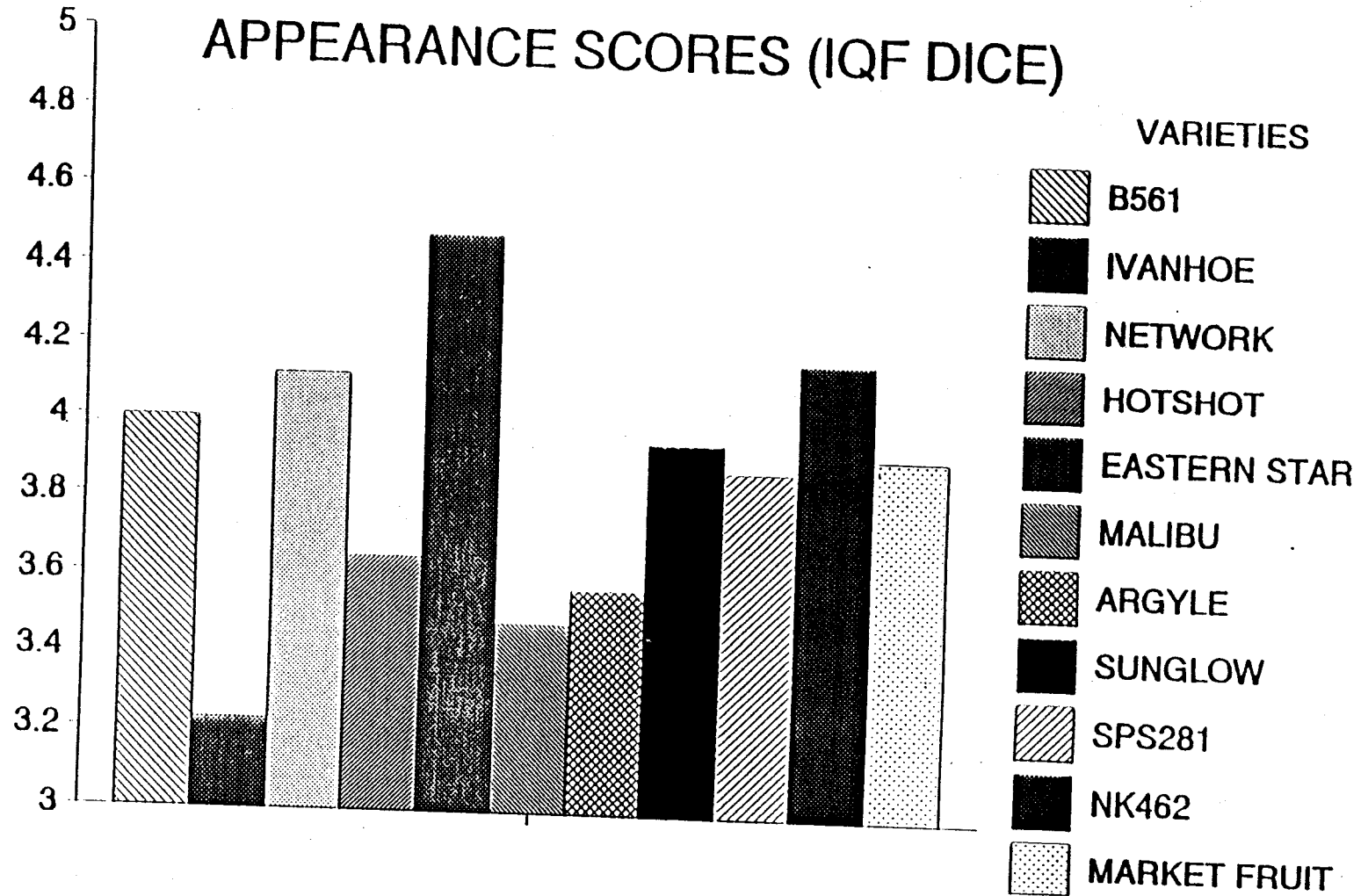
Table 9: Frozen Rockmelon Varieties - Sensory Data

Variety	Appearance	Flavour	Texture
B561	4.0	4.0	3.3
Ivanhoe	3.2	3.1	2.6
Network	4.1	3.1	3.2
Hotshot	3.6	3.5	2.6
Eastern Star	4.5	4.3	4.1
Malibu	3.5	3.0	2.9
Argyle	3.6	4.3	3.1
Sunglow	4.0	4.4	3.8
SPS 281	3.9	4.3	3.9
NK 462	4.2	4.1	3.7
Market fruit	3.8	3.9	3.3

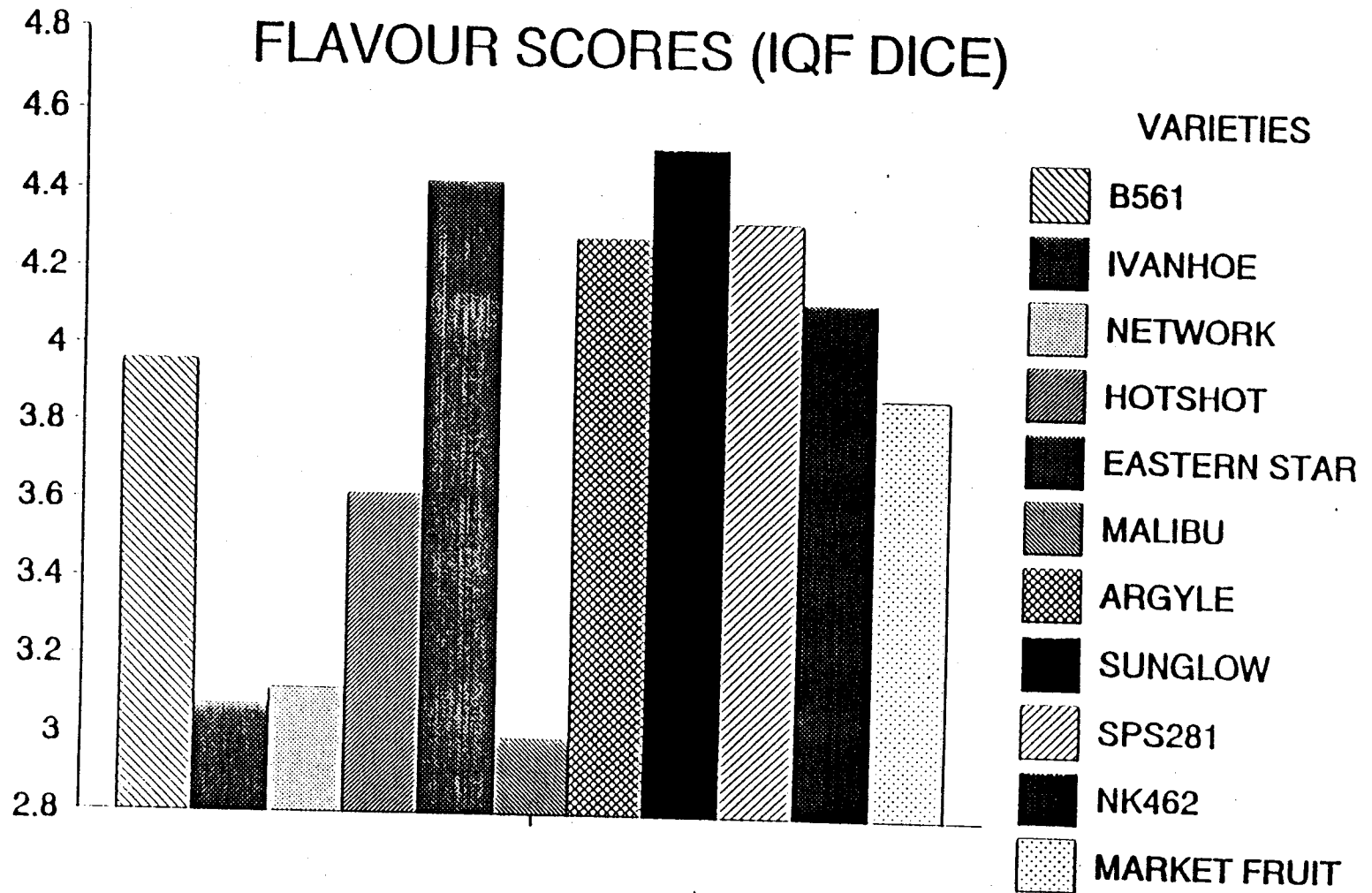
HONEYDEW FREEZING TRIAL #3



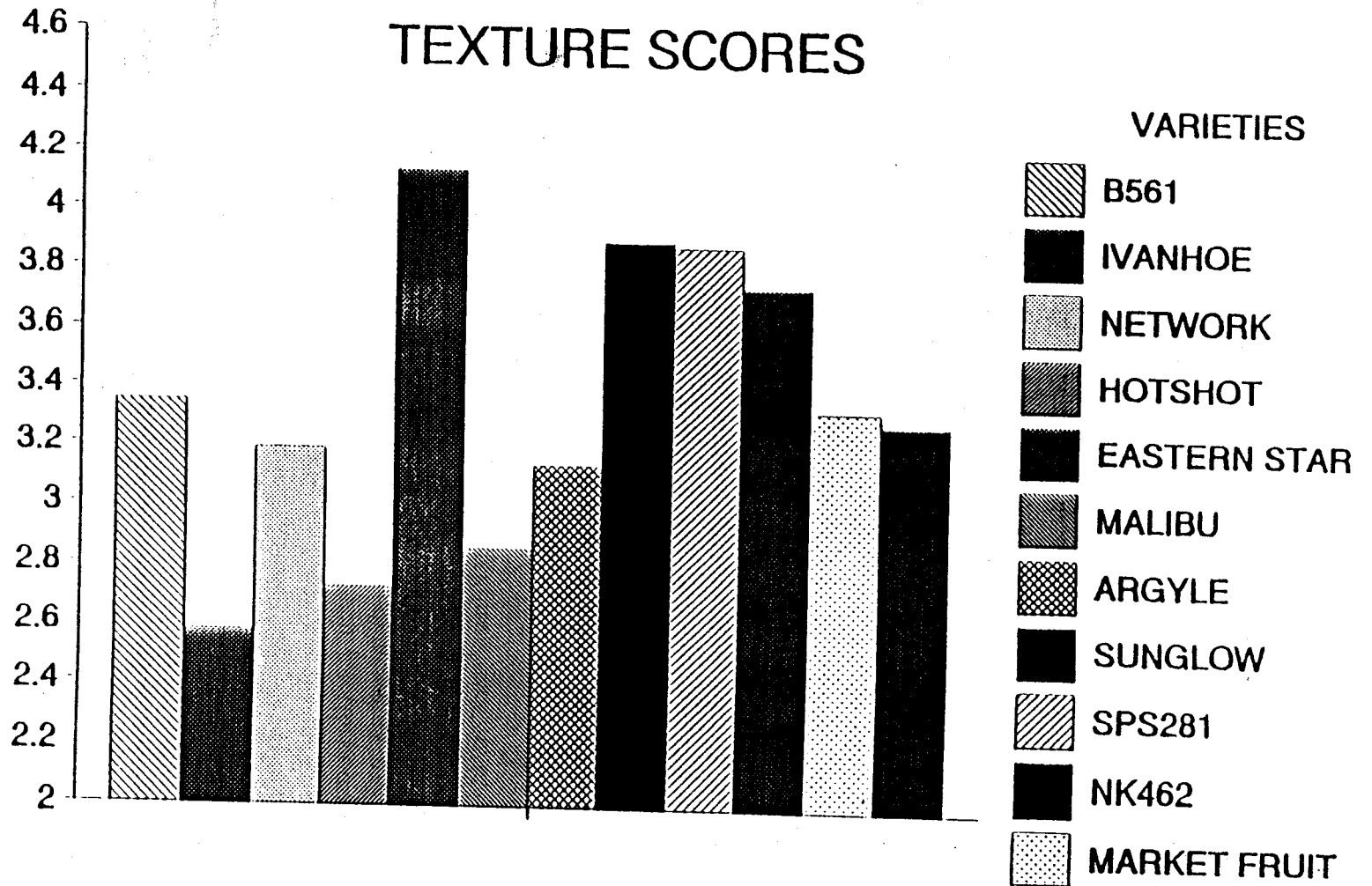
ROCKMELON FREEZING TRIAL #3



ROCKMELON FREEZING TRIAL #3



ROCKMELON FREEZING TRIAL #3



References

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