estimates deviated more than 5% (see Table 1).

Discrepancies between estimated and actual weight for the total 60 feet of row (Table 2) were also quite small. Field 1 had four estimates above 5% and Field 2 had three above 5% when individual samples were used. When indices from combined samples were used, only one estimate deviated more than 5%.

A 940-gram sample represents between 25% and 30% of the total pod weight of a 10-foot row. However, this sample is between 4% and 5% of the weight of the total row 60 feet long.

Confidence limits (95%) for the mean discrepancies are given in Table 2. There is an indication of added precision when using the results from two combined samples. If differences between entries are expected to be low (in the magnitude of 5%) then duplicate samples would be necessary. However, if differences of 10% exist, then a single sample should be sufficient.

Table 2. Shelled Weights and Discrepancies For 60 Feet of Row

10-Foot Section of Row	Percent Discrepancy: Using Index From Sample 1	Using Index From Sample 2	Using Index From Samples 1 & 2 Combined
Field 1			
1st	7.6	1.9	4.8
2nd	− .2	−2.0	−2.3
3rd	−5.9	−5.9	−5.9
4th	7.9	−2.5	2.7
5th	2.4	2.1	2.2
6th	− .4	−3.4	−2.0
Mean	1.9 ±4.5*	1.6 ±2.5*	.1 ±3.2*
Total weight = 9505 gr.			
Field 2			
1st	4.1	.4	2.2
2nd	−6.4	−2.5	−4.6
3rd	3.8	−1.3	1.3
4th	2.6	1.5	2.0
5th	4.6	−8.9	−2.0
6th	14.0	4.6	9.4
Mean	3.8 ±5.2*	1.0 ±3.7*	1.4 ±3.8*
Total Weight = 8220 gr.			

*95% confidence limits

An Effect of Row Orientation on Onion Development

By Jules Janick[2] and Flavio A. A. Couto[3]

An apparent difference in premature bolting was noticed between paired rows of onions planted in an east-west direction during the 1963 season in Vicosa, Minas Gerais, Brazil. Eight varieties of onions had been seeded April 14 (fall), transplanted to the field on June 7 (winter), and harvested in December (summer). The varieties were planted consecutively in the field in a serpentine arrangement. Double rows, 40 cm. apart, were separated by an irrigation furrow, 60 cm. wide, creating a "north" and "south" oriented row. The number of double rows per variety varied from 2 to 18.

Onions from each row were classified during harvest into three classes: bolters (flowering); non-bolters, tops down (mature); and non-bolters, tops upright (immature). The percentage of the non-flowering onions with tops down was used as an index of maturity.

The effect of row orientation on premature bolting is shown in Table 1. Chi Square analysis indicated that the increased flowering in the south as compared to the north rows, as well as the differences between varieties, was highly significant. The percentage flowering in the south row was approximately three times as great as the north row and there was no variety x position interaction (Figure 1). Highly significant varietal differences in maturity were found but none were attributable to row orientation. In general, the early maturing varieties had a low incidence of premature bolting.

In three of the varieties (Baia Periforme, Sintese 13 and 14) an analysis of premature bolting in the east and west side of the field as well as by north and south row orientation could be made (Table 2). Significantly, greater flowering was found in the south as compared to the north rows; no differences were attributable to the east and west sides of the field.

Microclimate effects have been associated with row and plant orientation. Effects of row orientation in celery have

Table 1. Effect of row orientation on premature bolting of eight onion varieties, Viscosa, Minas Gerais, Brazil, 1963.

Variety	Premature bolting[1]: Row orientation: North	South	Weighted average	Total plants
	%	%	%	No.
Excel Yellow Bermuda	0.00	0.04	0.02	5456
Baia Periforme	2.77	5.96	4.32	15823
Sintese 36	7.42	29.96	17.27	1372
Tipo Amarela Globular	8.74	27.36	18.34	638
Sintese 14	11.97	29.60	20.40	1456
Sintese 22	8.69	31.48	20.44	2994
Rio Grande	9.89	37.58	23.68	946
Sintese 13	12.84	36.06	24.32	1956
Total	4.43	12.75	8.54	30441

[1] Differences in variety and row orientation highly significant

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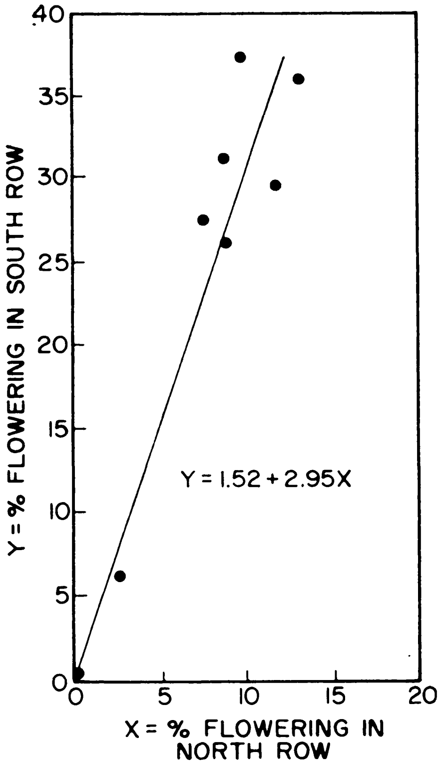

Fig. 1. Relation between premature bolting in north and south paired rows in eight onion varieties, Vicosa, Minas Gerais, Brazil.

been explained on the basis of differing soil temperature and sunlight relations (1). Similarly, citrus and mango tree quadrants based on the cardinal points of the compass indicated increased quality and productivity on the sunward side (4,6). The studies of Thompson and Smith (5) and Heath and Holdsworth (2) indicate that cold temperature is the critical factor in onion flower induction. Premature bolting in onions on the cool side of beds (presumably the north side) in California is noted by Shadbolt, McCoy and Little (3) in a study of bed orientation and soil temperature. The differential flowering response observed in the present study can be explained by the shading effect of the north on the south row, the north being the sunward side in the Southern Hemisphere. The declination of the sun in Vicosa (lat. 20′ 4″ S) during the winter (June to September) could very well produce this effect.

Row orientation could be a factor in selection efficiency for bolting resistance in onion where the planting pattern creates a double row. This can be overcome by planting rows in a north-south direction.

Table 2. Effect of row orientation and field position on premature bolting in 3 varieties of onion (Baia Periforme, Sintese 13 and 14), Vicosa, Minas Gerais, Brazil, 1963.

Premature bolting in percent[1]			
Row Orientation	Field position East	Field position West	Weighted average (N-S)[1]
North	5.94	5.41	5.67
South	13.63	13.20	13.41
Weighted average (E-W)	9.54	9.29	

[1] Difference in N-S flowering highly significant

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Effect of Storage and Stage of Flower Development on Viability of Pepper Pollen

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This experiment was initiated to obtain information on short term storage of pepper (*Capsicum frutescens* L.) pollen and to determine the effect of pollen maturity on fruit-set and seed production in peppers. Storage of pepper pollen for approximately 30 days is often desired in breeding and improvement programs for this crop. Hirose (4) concluded that differences in bud pollinations among pepper, eggplant, and tomato were due to differences in viability of their pollen. Erwin (3) reported that periods of both anthesis and dehiscence were relatively short for several varieties of pepper. Pollen longevity in general increases with decreasing temperature and decreasing humidity. Pal and Singh (6) reported that the longevity of eggplant pollen under open conditions in India was 1 day in summer and 3 days in winter. Natural cross-pollination in peppers was reported by Markus (5) to occur mainly between the hours of 7 and 11 in the morning.

For the short term pollen storage experiment, 200 flower buds were selected on healthy plants of the pepper cultivar, Truhart Perfection (1). Anthers were removed from these buds between 7:00 am and 8:00 am on August 5, 1965 before dehiscence occurred and placed in a glass beaker. After thorough mixing, they were divided into 3 lots of approximately 300 anthers each, placed in separate Petri dishes and covered. The following storage treatments were employed: room storage at 22-26°C and relative humidity of 50-70%; household refrigerators with 2-6°C and relative humidity of 40-50%; household refrigerator with 2-6°C and pollen over $CaCl_2$. Pollen from each storage treatment was used to pollinate 5 previously emasculated and bagged flowers on each of 8 Truhart Perfection plants. Pollinated flowers were covered with a special cone (2) to prevent contamination by foreign pollen. Pollen viability was based on the percentage of pollinated flowers that set fruit and on the number of seeds produced per fruit. The number of seeds produced was also recorded for open pollinated fruits from some of the test plants at each period, for comparison with the controlled pollinations.

The viability of pepper pollen from flower buds at 6 stages of development

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