

# Screening of advance breeding lines/cultivars for shelf-life and biochemical changes during storage of ash gourd (*Benincasa hispida*)

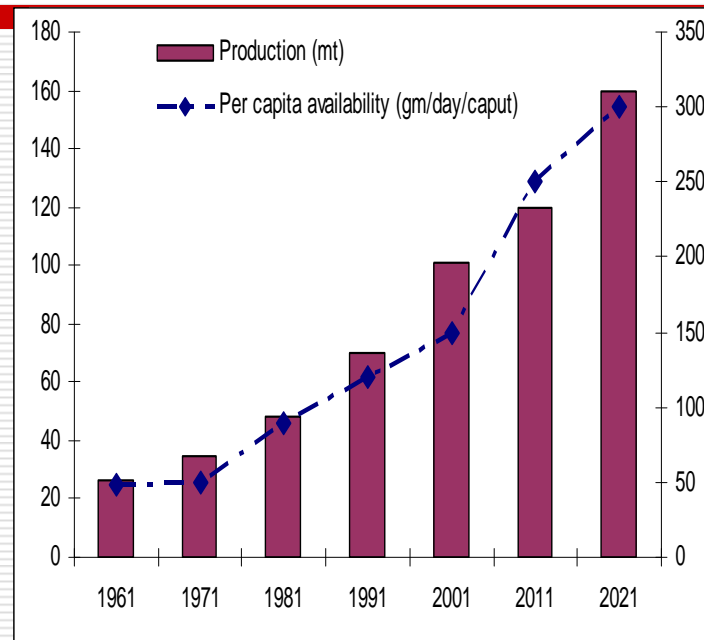
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**Varanasi**





# India : Current Status

- Second largest producer
  - India's share ~ 13 %
- Largest producer of:
  - Okra, cauliflower, peas
- Occupy ~ 4% of cultivable area
- Production growth ~4.6% annually
- Export 20% annual increase
- Total export exceeds Rs. 2000 crores



**Population growth rate: 1.98**  
**Estimated requirement of vegetables**

**2010-11 : 130 mt**

**2020-21 : 160 mt**



# Cucurbitaceae

- ✚ consists ~118 genera and 825 species
- ✚ Cucurbits are globally cultivated in 9.16 m ha, total production 193.4 million tons (FAO, 2006)
- ✚ Cucurbits share 5.6% of total vegetable production
- ✚ Many of the members are originated in Indo-Burma-Malaya region
- ✚ 30 species of cucurbit are under cultivated world over
- ✚ 22 cucurbit species are grown in India.
- ✚ About half of these species originated in India itself.
- ✚ This family constitute about 1/3 of the total number of vegetables grown in the country



## ***Benincasa hispida***

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- ❖ It is member of cucurbitaceae family
  - ❖ Syn: Ash gourd, wax gourd, white gourd, winter melon Chinese preserving melon, chinese squash
  - ❖ Commonly grown in China, India, The phillipines and other Asian countries
  - ❖ Also grown in Latin America and Caribbean
  - ❖ In China it has been cultivated from more than 2300 years
  - ❖ And believed to be originated in South East Asia
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## *Benincasa hispida* Medicinal and Health

Lakshmi Senaratne, senior scientist (Ayurveda)  
Bandaranaike International Ayurveda Research  
Institute

- Ayurveda physicians call it kushmanda and a preparation with the fruit is called kushmanda avaleham.
- Alleviates vatha and pitta (raw fruit), Improve digestive system and cooling to the body
- Useful to control burning or smarting sensation in the body or burns (Fruit paste or leaf juice)
- Headache (Seed oil)
- Treat mercury poisoning (fruit juice)
- Increase the power of the brain as well as the ability to remember



## ***Benincasa hispida* – contd...**

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- Also induces healthy sleep and increases urine
  - Cleans the bladder (very ripe fruit when taken internally)
  - Reduce bad smelling or concentrated urine
  - Laxative and reduces thirst
  - Seeds anthelmintic and has special effect on tapeworm (take half-a-teaspoon of seed powder, twice a day for one week)
  - It strengthens a weak heart and the lungs (as curry -31 % population world wide on risk of heart attack)
  - Effective who has cavities in the lungs and who suffers from tuberculosis
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## *Benincasa hispida* – contd...

- For women experiencing excessive bleeding (menstruation twice a month) eat kushmanda avaleham (it reduces and stops bleeding)
- Recommended for women suffering from excessive vaginal discharge
- Also increases sperm and treats disorders and defects of sperms
- For mental disorders (ripe variety)
- For disurea (difficulty is passing urine) and stones in the bladder (eat curry)
- Lean people gained body weight ( prepare the paste with ghee and eat in order to increase body weight-0.83 billion are under-weight)



## USES

- ❖ Immature fruits eaten raw, cooked as curry, soup
- ❖ Entire fruit is steamed after stuffed with lotus seed green vegetable and meat
- ❖ In India mature fruits mix with Dal to make “ Sambhar” and curry
- ❖ Young leaves, growing tips and flower buds are boiled and eaten as green





## Uses - Industrial



Famous Petha



**Bari** →

Black gram, Green gram  
+ Benicasa + Spices





## WAX GOURD, let us say **WORSHIP** **GOURD**

Fruits are given as a token of luck to bride and groom at the wedding feast





# Availability

<b>Sowing</b>	<b>Ready for harvest</b>	<b>Available</b>
<b>March</b>	<b>August</b>	<b>Aug-Sep-Oct-Nov</b>
<b>June</b>	<b>Nov</b>	<b>Nov- ?</b>



# Why study initiated

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- ❖ Fresh as well as stored fruits are utilized for manufacturing of petha (Sweets), Bari (preparation with legume) and also for vegetable (Curry) purpose
- ❖ No systematic research undertaken for improvement of varieties for above purposes and their storability



Indigenous preparation

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# Why study initiated

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- ❖ The storability depends upon the genotype and cultivars
- ❖ The biochemical changes during storage affect the quality of product prepared from the stored fruits
- ❖ No standardized method and recipe are standardized



**Good scope to develop as cottage industries**

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# Methodology

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- The experiment was conducted at IIVR 2006-07
  - The experiment was laid out in RBD in 3 replication
  - Nineteen genotypes/cultivars selected for study
  - 25 Mature fruits were kept at ambient temperature of all 3 replication to observed the storability
  - Fresh fruits of all genotypes/cultivars from each replication taken for biochemical analysis and one set (4 fruits of all genotypes) kept to determine the same biochemical analysis after 75 days of storage
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# Advance lines

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# Observations

## Storage

- Physiological loss in weight
- Percent rotting of fruits (decay loss)
- Total soluble solids (TSS %)

## Quality parameters

- Protein (mg/100g)
- Fat (mg/100g)
- Vit C (mg/100g)
- Dry matter (g/100g)
- Calcium (mg/100g)
- Pectic substances (g/100g)
- Crude fibre (g/100g)
- Total sugar (%)





# Decay loss during storage

Percent decay loss during storage of ash gourd in 20 days interval							
Genotypes	Days of observation						
	0	20	40	60	80	100	120
IVAG -126-1	0	20	40	40	100	-	-
IIVAG -58	0	20	20	20	40	80	100
IVAG-3	0	0	0	0	20	80	100
IVAG -81	0	0	0	20	40	60	100
PAG -3	0	0	0	40	40	60	80
IVAG -90	0	0	0	20	20	20	20
IVAG -502	0	0	0	0	0	0	20
IVAG- 50	0	0	0	0	0	0	20
IVAG -223	0	0	0	0	20	20	40
HYBH -24	0	0	0	0	0	20	40
HYBH -25	0	0	0	0	40	60	80
IVAG-54-1	0	0	0	0	0	40	80
BH -21	0	0	0	0	0	40	60
IVAG- 06-05	0	0	0	0	0	60	100
IVAG -06-04	0	0	40	0	20	40	100
IVAG -205	0	0	0	40	40	60	100
IVAG -88	0	0	0	0	0	0	40
IVAG -71	0	0	0	0	0	0	20
Hybrid -600	0	0	0	0	0	0	0
G.Mean	0	2.11	6.32	10.53	25.26	35.56	61.11
C D at 5%	0	0.25	0.38	1.26	2.53	3.20	5.19



## Physiological weight loss during storage

Genotypes	Percent physiological weight loss during storage						
	Days of observation						
	0	20	40	60	80	100	120
IVAG -126-1	0	5.36	12.33	15.94	21.25	-	-
IIVAG -58	0	6.66	19.60	26.27	27.01	27.18	-
IVAG-3	0	4.17	11.20	18.40	28.79	28.86	-
IVAG -81	0	5.12	12.85	18.74	37.60	38.20	-
PAG -3	0	4.80	9.18	16.49	22.12	22.56	22.56
IVAG -90	0	3.82	10.03	16.42	23.12	23.58	23.70
IVAG -502	0	4.40	10.64	16.98	22.68	22.92	23.50
IVAG- 50	0	4.46	10.14	13.70	19.20	20.00	21.00
IVAG -223	0	3.69	8.60	13.65	17.91	18.00	20.38
HYBH -24	0	4.11	9.05	13.36	18.72	18.98	19.89
HYBH -25	0	3.86	7.71	13.16	19.34	20.00	21.00
IVAG-54-1	0	4.89	11.17	16.80	20.73	21.54	22.54
BH -21	0	5.71	13.91	16.29	23.48	23.82	24.20
IVAG- 06-05	0	6.21	19.33	26.19	33.76	34.12	35.10
IVAG -06-04	0	4.20	7.34	11.53	17.35	18.14	19.30
<b>IVAG -205</b>	<b>0</b>	<b>6.02</b>	<b>14.33</b>	<b>22.32</b>	<b>40.08</b>	<b>40.50</b>	<b>41.15</b>
IVAG -88	0	5.00	10.89	18.09	21.77	22.42	22.80
IVAG -71	0	5.17	10.02	13.71	19.48	20.32	21.25
<b>Hybrid -600</b>	<b>0</b>	<b>4.73</b>	<b>9.42</b>	<b>12.62</b>	<b>15.62</b>	<b>15.93</b>	<b>16.40</b>
G. Mean	0	4.862	10.28	16.87	23.63	24.28	23.65
CD at 5%	0	0.58	1.03	1.69	2.37	2.43	2.25

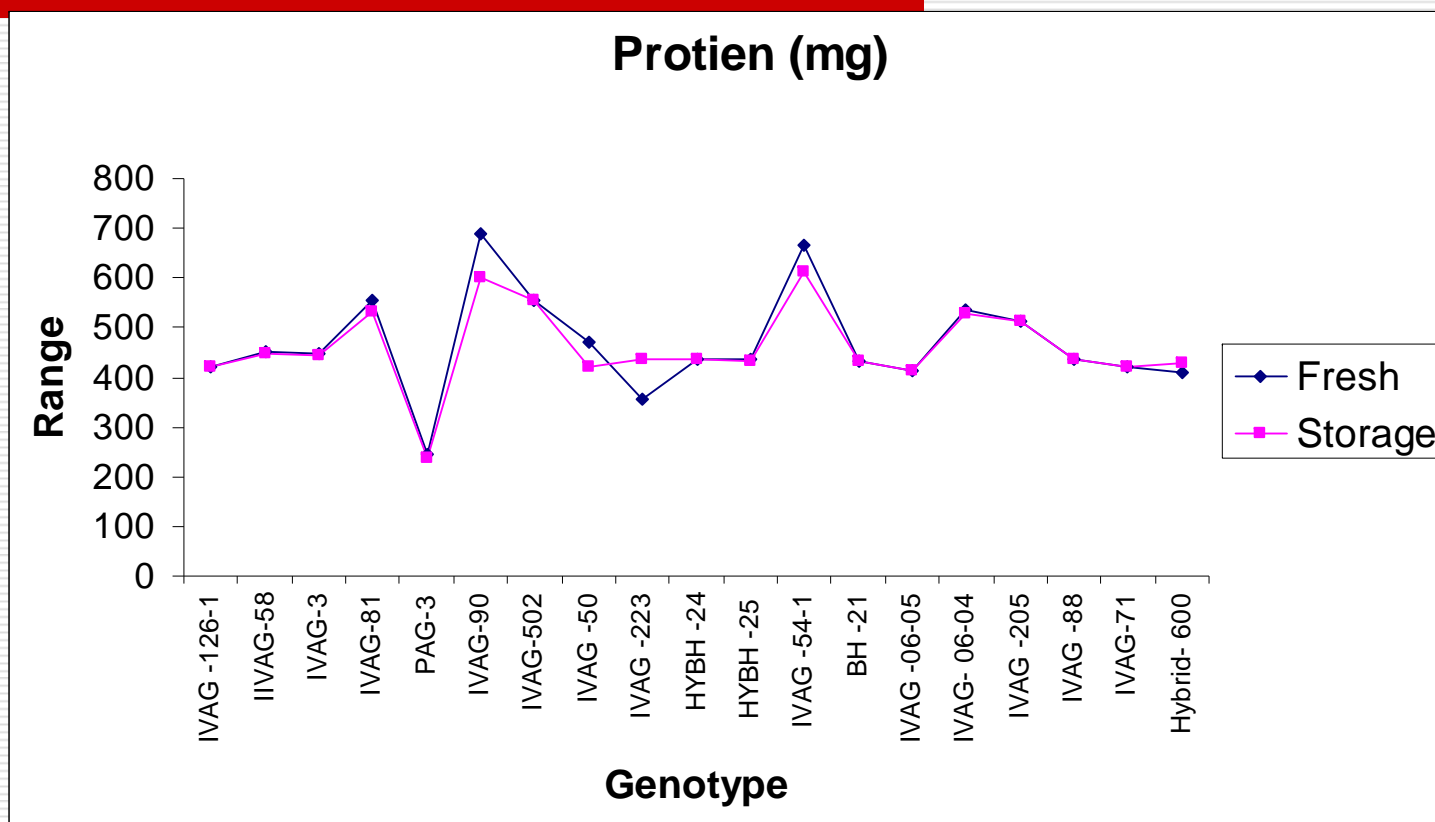


## Change in TSS (%)

Genotypes	0	20	40	60	80	100	120
IVAG -126-1	2.1	2.3	2.6	2.8	3.0	0	0
IIVAG -58	1.7	1.9	2.0	2.0	2.0	2.0	0
IVAG-3	1.6	1.6	1.8	2.1	2.3	2.3	0
IVAG -81	1.8	1.9	1.9	2.0	2.0	2.0	0
PAG -3	1.8	1.8	2.0	2.0	2.2	2.3	2.3
IVAG -90	1.8	2.0	2.0	2.0	2.3	2.3	2.3
IVAG -502	2.3	2.5	2.8	3.0	3.0	3.0	3.0
IVAG- 50	1.8	1.8	2.0	2.0	2.1	2.2	2.2
IVAG -223	2.2	2.6	2.6	2.8	2.8	2.8	2.8
HYBH -24	2.0	2.2	2.1	2.4	2.4	2.4	2.4
HYBH -25	1.8	1.9	2.0	2.1	2.2	2.2	2.2
IVAG-54-1	2.0	2.1	2.3	2.3	2.4	2.4	2.4
BH -21	1.7	1.7	2.0	2.0	2.1	2.1	2.1
IVAG- 06-05	1.4	1.6	1.8	2.0	2.0	2.0	0
IVAG -06-04	2.0	2.0	2.1	2.2	2.3	2.3	0
IVAG -205	1.7	1.8	2.0	2.0	2.0	2.0	0
IVAG -88	2.0	2.0	2.1	2.3	2.3	2.3	2.3
IVAG -71	1.7	1.9	2.0	2.0	2.2	2.2	2.2
Hybrid -600	2.0	2.2	2.4	2.4	2.6	2.6	2.6
G.Mean	1.86	1.99	2.13	2.23	2.33	2.3	2.20
C D at 5%	0.22	0.24	0.26	0.27	0.28	0.27	0.26



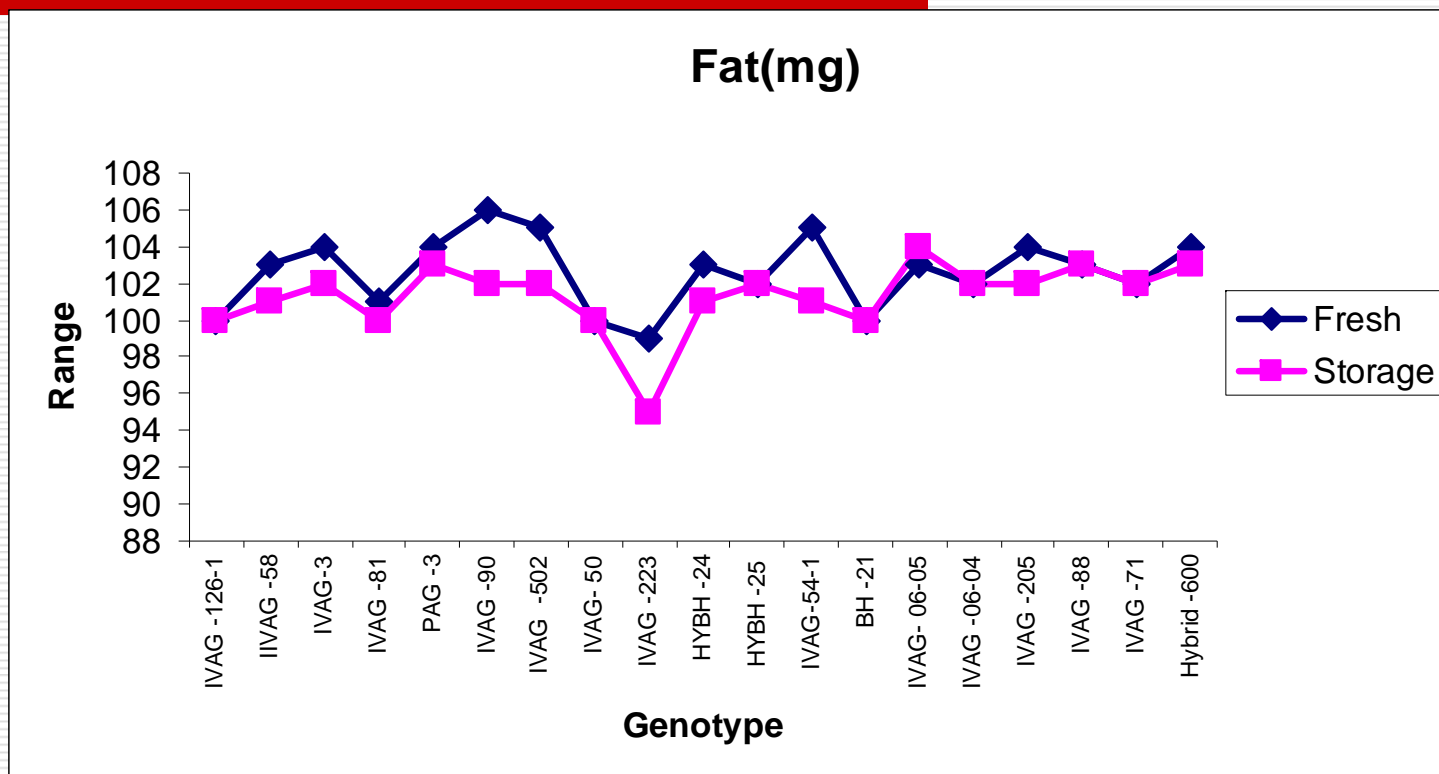
# Protein (mg/100g)



**Fresh : 243.9-690, Storage : 238.9-612, Decrease 1.48%**



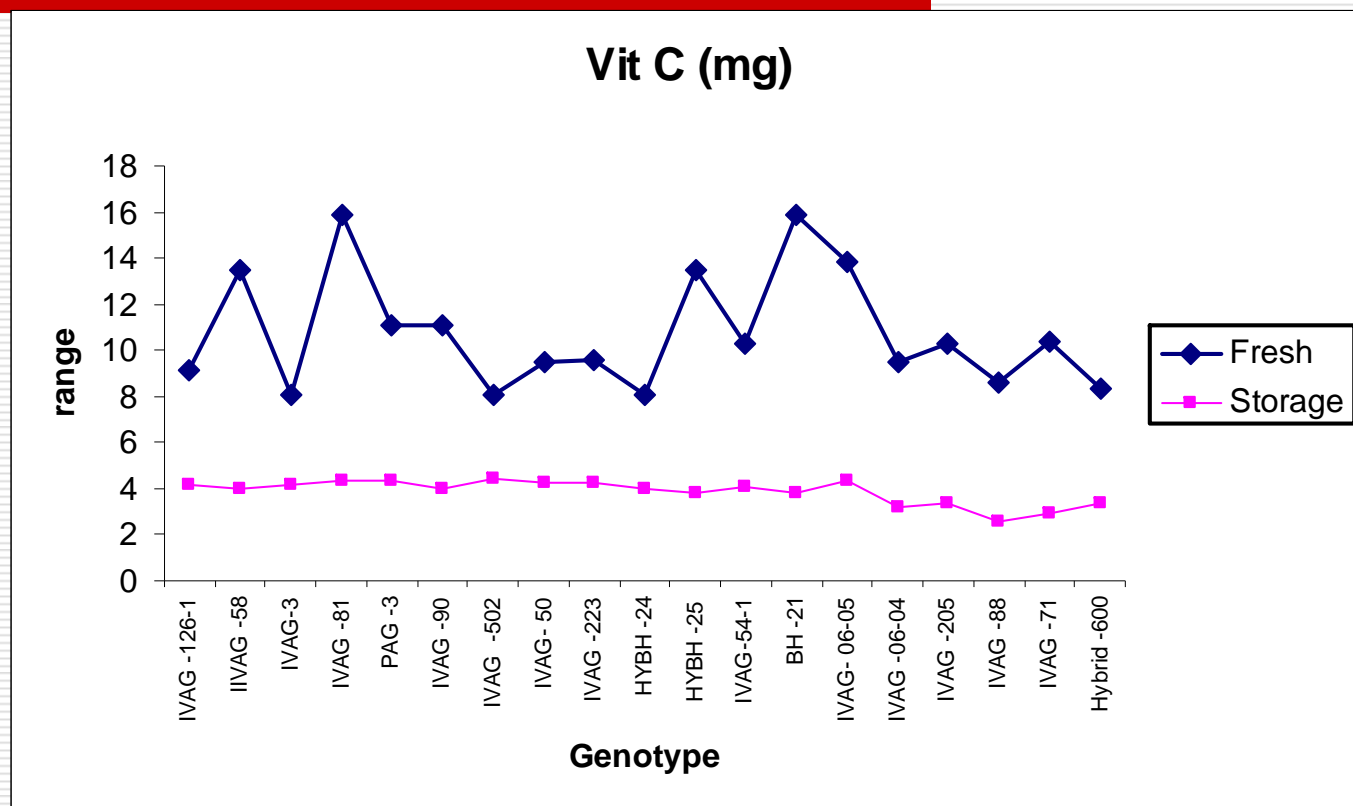
# Fat (mg/100g)



**Fresh : 99.1-106, Storage : 95-104, Decrease 0.03%**



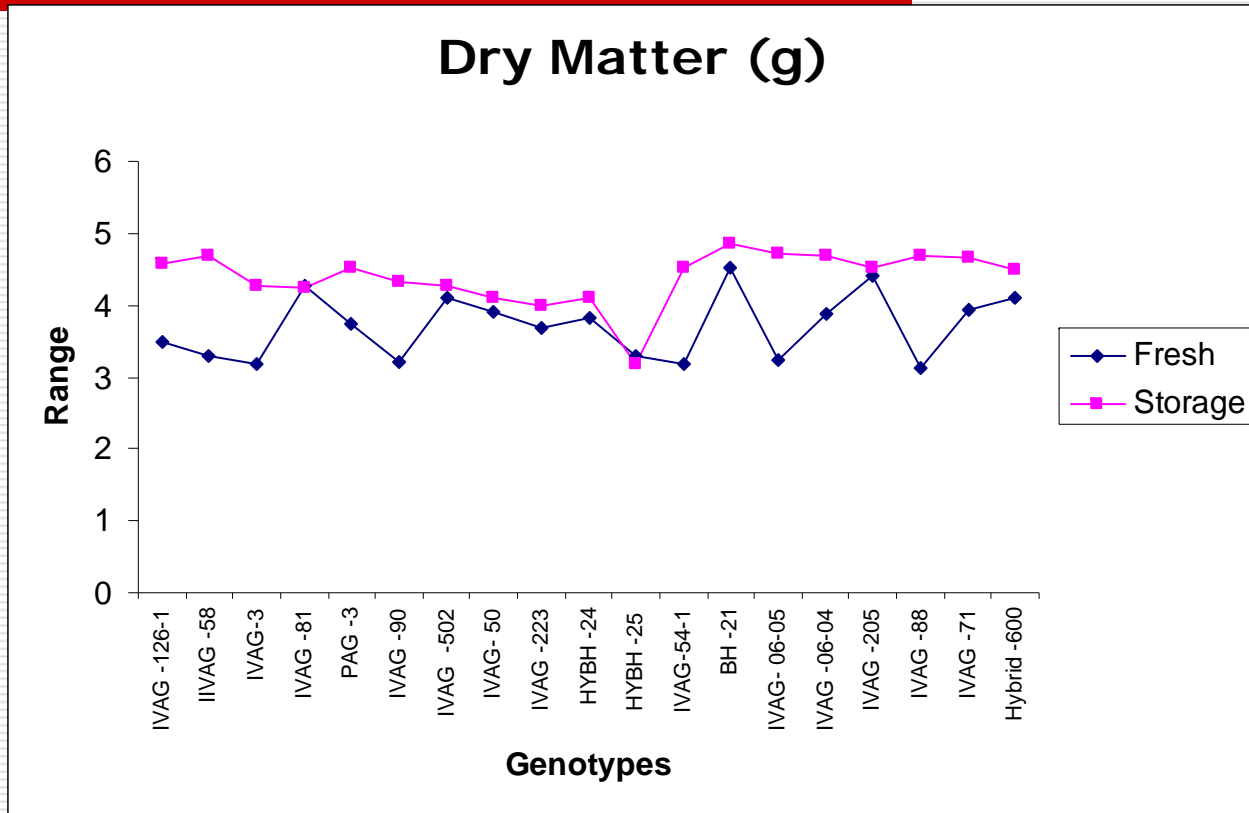
# Vitamin – C (mg/100g)



**Fresh : 8.08 – 15.86, Storage : 2.54-4.85, Decrease 60%**



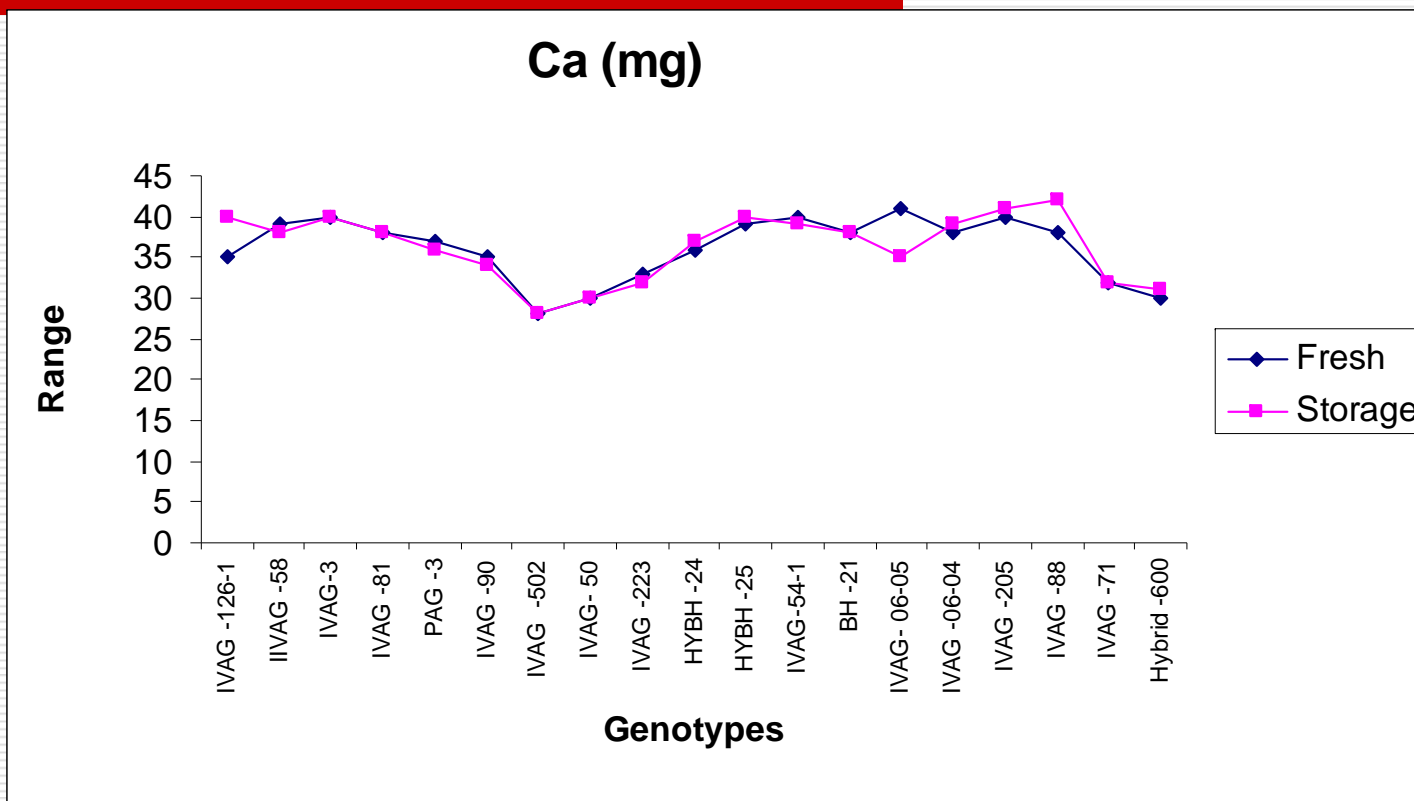
# Dry matter (g/100g)



**Fresh : 3.13-4.52, Storage : 3.17-4.72, Increase 24.97%**



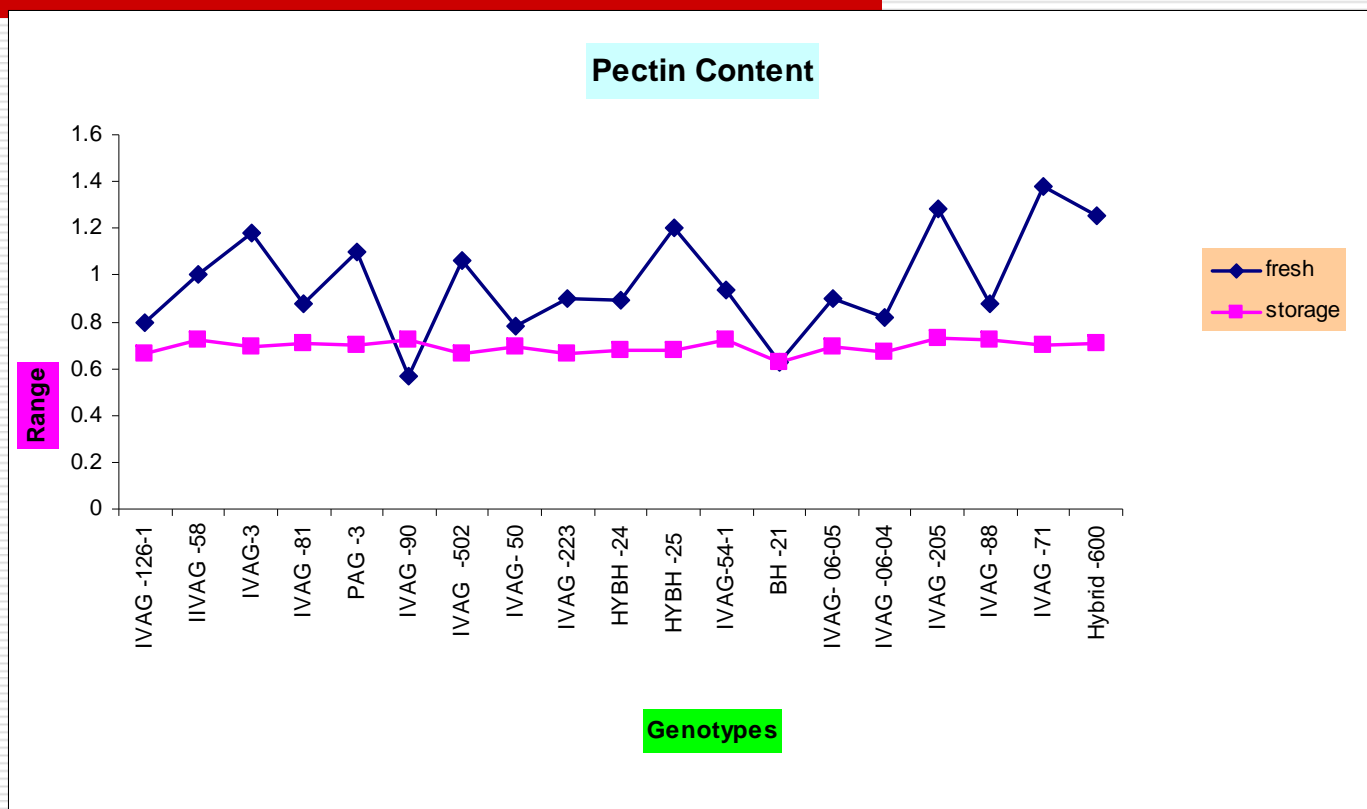
# Calcium (mg/100g)



**Fresh : 28-41, Storage : 31-42, Increase 0.97%**



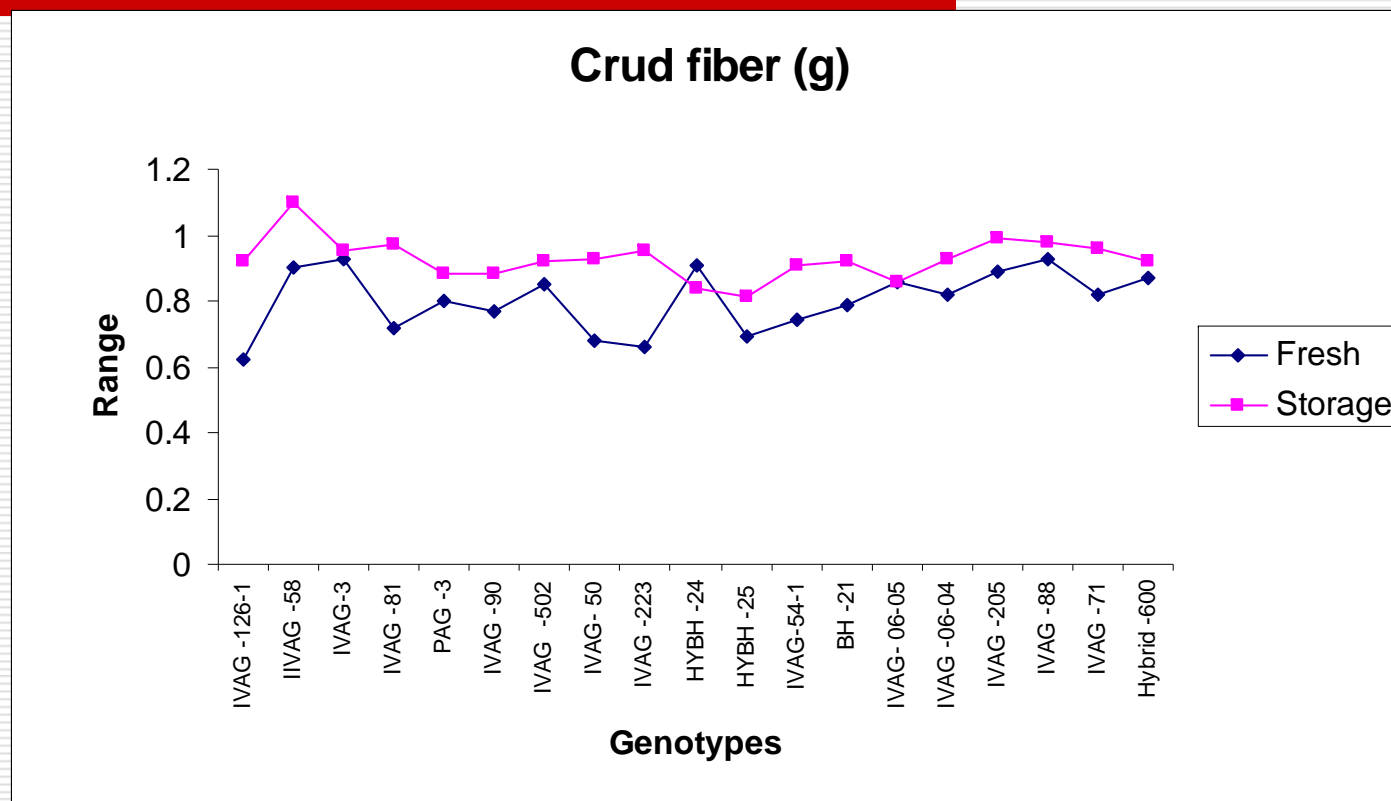
# Pectin (g/100g)



**Fresh : 0.63-1.38, Storage : 0.63-0.73, Decrease 28.82%**



# Crud fiber (g/100g)



**Fresh : 0.62-0.93, Storage : 0.81-1.1, Increase 13%**



## Total sugar (%)

<b>Genotypes</b>	<b>Fresh</b>	<b>Storage</b>	
IVAG -126-1	2.97	3.18	
IIVAG -58	1.02	3.67	
IVAG-3	<b>3.89</b>	4.17	
IVAG -81	3.50	4.12	<b>Increase: 27%</b>
PAG -3	3.27	3.96	
IVAG -90	1.29	3.10	
IVAG -502	2.25	3.57	
IVAG- 50	3.34	4.14	
IVAG -223	3.80	4.13	
HYBH -24	3.61	4.00	
HYBH -25	2.69	3.18	
IVAG-54-1	3.30	3.82	
BH -21	1.45	<b>2.93</b>	
IVAG- 06-05	2.53	3.53	
IVAG -06-04	3.22	3.89	
IVAG -205	3.08	3.91	
IVAG -88	<b>0.80</b>	1.77	
IVAG -71	3.47	4.01	
Hybrid -600	3.46	<b>4.72</b>	



# Product development

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## Conclusion

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- The genotype IVAG-502, IVAG-50, IVAG-71 have storage life >100 days, while Hybrid-600 >120 days
  - The quality parameter like sugar content crude fibre, calcium, dry matter increased, whereas vit. C, Fat and protien decreased during storage
  - Hybrid development (maximum combination) for better storability and quality
  - Further validation of results and needs quality analysis of processing product
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