

STUDIES ON FOUR INTERVARIETAL CROSSES OF *CAPSICUM ANNUUM* WITH REFERENCES TO CHEMICAL CONSTITUENTS *

P. Manikantan Nair and Mary K. George,
Agricultural College, Vellayani, Kerala.

The different varieties of *C. annum* show varied chemical constituents. Some varieties are richer in ascorbic acid content, a ready source of Vitamin G while others contain more of capsaicin which is the principal alkaloid responsible for the pungency of the fruits. Sucrose is also another major ingredient. This paper embodies the results of studies on the chemical constituents of some local varieties and Sntervarietal hybrids of chillies,

Materials and methods

Four hybrids and five parents of the varieties of *C. annum* were studied for the ascorbic acid, capsaicin and sucrose content. Variety "local blue" was taken as the seed parent while the pollen parents included the varieties "Russian" "Indian long red", "Chinese giant" and "Oskosh".

Fully ripe fruits alone were used in the investigations. The fruit extract in oxalic acid was titrated against phenol Indo 2:6 dichloro phenol dye solution for the estimation of ascorbic acid. Light but distinct pink colour was taken as the end point. Fehlings solution method was adopted to investigate sucrose content and Spanyar and Blazovich's method (1969) was adopted for the estimation of capsaicin.

Results and discussion

The results are presented in tables 1 and 2. Among parents, Oskosh exhibited maximum amount of ascorbic acid (438.5mg/100 gm) and local blue, the common seed parent, the minimum (139.65 mg/ 100 gm.). Two hybrids, local blue x Russian and Local blue x Chinese giant registered a marked increase over the better parents as well as the parental means. The two remaining hybrids local blue x Iodian long red and local blue x Oskosh exhibited a decrease over their respective parents, the percentage being 4.01 and 5.55 respectively.

As shown in table 2 among the parents the variety Oskosh exhibited maximum percentage of sucrose followed by Chinese Giant. The common seed

Table 1. Ascorbic acid (Vitamin C) content in ripe fruits of Chillies.

TREATMENT	Ascorbic acid in milligram per 100 grams of ripe fruits	Percentage of deviation of F ₁ mean from the	
		Better parent	Parental mean
1. Local blue	139.65	11.65(+)	65.41(+)
2. Local blue x Russian	445.50		
3. Local blue x Indian long red.	370.20	4.01 (-)	40.89(+)
4. Russian	399.00		
5. Indian long red	385.70		
6. Local blue x Chinese giant	382.75	18.94(+)	65.89(+)
7. Chinese Giant	321.80		
8. Local blue x Oskosh	441.15	5.55(-)	43.2(+)
9. Oskosh	438.5		

parent "Local blue" possessed the minimum amount of sucrose. Two hybrids Local blue x Russian and Local Blue x Indian Long red surpassed their respective better parents in the sucrose content, the increase being 366.03 percent and 346.58 percent respectively. The other two hybrids Local blue x Chinese Giant and Local blue x Oskosh showed a decrease in sucrose content from their respective better parents. However all the 4 hybrids showed a marked increase over their respective parental means.

Table 2 reveals that among the parents, local blue the common seed parent exhibited maximum percentage of capsaicin content viz. 0.71 and the minimum in the variety Russian (0.14). Of the hybrids, all except LB x OS displayed a marked decrease in capsaicin content when compared to their better parent, while the local blue x Oskosh registered a positive heterosis. The increase over better parent was 25.35 percent. When the parental means were taken into account the same results were obtained. All the hybrids except Local blue x Oskosh manifested pronounced decrease while the cross Local Blue x Oskosh registered an increase of 61.81 percent. Capsicum provides one of the richest sources of Vitamin C (Ascorbic acid). Different varieties exhibit varied range of this nutrient content. The same is the case with sucrose.

Table 2.

TREATMENT	Percentage of sucrose content	percent deviation of F ₁ mean from the		Percentage of capsaicin content.	Mean increase or decrease in percent of F ₁ over	
		Better parent	parental parent		Better parent	parental mean
Local blue	0.74			0.71		
Local blue x Russian	4.154	366.93(+)	409.43(+)	0.35	50.70 (-)	15.66(-)
Russian	0.832			0.14		
Local blue x Indian long red.	1.187	346.58(+)	450.46(+)	0.4	43.6 (-)	39.39(-)
Indian long red	1.187			0.62		
Local blue x Chinese giant.	3.757	0.05(-)	60.003(+)	0.37	47.88 (-)	19.56(-)
Chinese giant	3.957			0.21		
Local blue x Oskosh	4.301	2.73(-)	66.64 (+)	0.89	25.35 (+)	61.81(-)
Oskosh	4.422			0.39		

As opposed to the findings of Betlach (1967) and in agreement with Ghrobczek *et al.* (1960) all the hybrids of the present study manifested hybrid vigour in the ascorbic acid content. In the present work also the vitamin C content of two hybridization hybrids displayed positive heterosis. In accordance with the results of Michna (1966) and Butkevic (1967) the increase in ascorbic acid content was observed along with the ripening of fruits. The heterotic effect of ascorbic acid content was recorded by Lal (1968) in Dolichos Lab. This apparently suggests that pollen parents have different genetic constitution for the expression of this trait. Capsaicin is the active alkaloid ingredient responsible for the pungency of chillies. Webber (1911) and Despande (1935) recorded that pungency is a heritable character controlled by a single dominant gene. Out of the four crosses only local blue x Oskosh provided a positive heterosis in the expression of the trait. The analysis of capsaicin in parents and other hybrids does not seem to be in agreement with the observation of Webber (1911) and Despande (1935). On the other hand it leans more towards the conclusion of Ramanujam and Thirumalachar (1966) that the genetic control of capsaicin production is under polygenic system. It appears that the reduction in the capsaicin content in the above hybrids may be due to the presence of high sucrose content. This agrees with the suggestion of Severs and McIntyre (1921) that the presence of sugar masks the expression of pungency. The sucrose content in all the four hybrids

exhibited heterosis. Two hybrids Local blue x Russian and Local blue x Indian long red surpassed better parents, again indicating the diverse genetic architecture of the male parents.

Summary

Four hybrids and five parents of the varieties of chilli *C. annum* were studied for the ascorbic acid, capsaicin and sucrose content. The "local blue" variety was taken as the seed parent. The pollen parents included varieties, Russians long Red, Chinese giant and Oskosh. As regards Ascorbic acid, the hybrids local blue x Russian and local blue x Chinese giant expressed hereotic effect. With respect to sucrose content Local blue x Russian and Local blue x Indian long red surpassed their respective better parents. Local blue Oskosh alone registered positive heterosis in capsaicin content. The decrease in capsaicin content in hybrids may be attributed to the presence of sucrose.

Acknowledgement

The authors gratefully acknowledge the facilities provided by Dr. J. Srin Raj, Dean, Agricultural College for the conduct of these experiments.

REFERENCES

- Betlach, (1967). Some results of heterosis breeding of sweet pepper. "Geneticka" a Slechteni 3, 239-252
- Butkevic, S.T (1967) Vitamin in sweet peppers. Russian from R. £. Z. - (Rastew) *Abst* 55, 385
- rhrobocek, E, et. al (1966). The superiority of sweet pepper hybrids as compared with standard varieties as shown by experiments conducted in the Czechoslovakian Socialist Republic the German Democratic Republic and Poland *Rocozon Nauk reb* 91, 299-328
- Despande. (1935) Studies in Indian chillies. The inheritance of some characters in *Capsicum annum* L. *Indian. J. Agr. Sci.* 3, 219-300.
- Lal, S. (1968) Heterosis for Ascorbic acid content in Sem. *Ind. J. of Genet. and P.* 6. 28, 223-224
- Michna M. (1966) The content of some chemical substances depending on fruit ripeness of several foreign red pepper varieties. *Roczn Naukrol* 91, 421-428
- Ramanujam, S. and D. K. Thirumalachar (1966) Component analysis of capsaicin content in chilli. *Ind. J. Genet.* 26, 227-29
- Webber, H.J. (1911). Priliminary notes on pepper hybrids. *Ann. Rep. Amer. Breed. Assoc.* 7, 188-99

(M. S. received 3-1-1973.)