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Research Article

High yielding and moderately resistant to fruit rot disease chilli hybrid – CCH 1 (TNAU Chilli Hybrid CO 1)

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Abstract

Anthracnose is one of the serious diseases in chilli which affects whole plant and also fruits in particular. A study was undertaken to develop a high yielding and anthracnose disease resistant hybrid in chilli at the Dept. of Vegetable Crops, HC & RI, TNAU, Coimbatore during 2004-05. As a first step, ninety three germplasm lines maintained in the Dept. of Vegetable crops were evaluated for disease resistant and yield. Three single plant selections namely Sln 1, Sln 2 and Sln 3 made in advanced generations of a hybrid were found to be resistant and the genotypes Arka Lohit, Pepper Hot, CA 97, KDC 1, CC 4, CA 95, CA 115 and CA 59 were found to be moderately resistant. These selected lines were used both as male (testers) and lines as female parents and 30 hybrids were obtained. All these hybrids were tested for the performance of yield, quality and disease resistance. Among them the hybrid combination of Sln 1 x CA 97 was identified as best performed hybrid CCH 1(TNAU Chilli Hybrid CO 1). This was test verified across the state in 8 MLT and 103 ART plots along with NS 1701 and K 1 as check. The results showed that the per cent increase was 14.65 over NS 1701 and 51.40 over K 1for green fruit yield and 19.15 and 60.86 for dry fruit yield respectively. The fruit rot incidence in terms of Percentage of Disease Index (PDI) observed was 12.50 and hence it is comes under moderately resistant group. This entry CCH 1 has been released as TNAU Chilli Hybrid CO 1 during the year 2009-10.

Key words: Chilli, anthracnose, fruit rot, resistance

Introduction

Chilli (*Capsicum annuum* L.), a solanaceous vegetable cum spice, native to New World of tropics and sub-tropics was introduced into India from Brazil in sixteenth century by the Portuguese. It is a good source of vitamin A (292 I.U per 100 g), vitamin C (111 mg per 100 g) and thiamine (0.19 mg per 100 g). It is mainly cultivated for three constituents of fruits *viz.,* capsaicin, capsanthin and oleoresin. Pungency, one of the important quality attributes of *Capsicum* species is due to the presence of alkaloid 'capsaicin' in the fruit. Chilli cultivation is mostly concentrated in the southern states like, Andhra Pradesh, Karnataka, Maharashtra, Orissa and Tamil Nadu occupying nearly 75 per cent of the total area under this crop in India. With its wide range of agro climatic situations India is blessed with significant level of genetic variability, which could be harnessed efficiently to meet out the needs of consumers, processing industries and export market. Though India stands first in chilli cultivation in the world, the productivity of dry chilli is too low (0.9 t/ha) compared to world average (2.0 t/ha).

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Among the major constraints in the production of hot pepper, anthracnose caused by a seed-borne pathogen *Colletotrichum capsici*, is very deleterious causing considerable damage to the crop both in yield and quality of the produce. The fruit rot is one of the worst maladies in chilli and it occurs in severe form in all the southern states which leads to the yield loss up to 30 per cent (Durairaj, 1972). The maximum development of fruit rot takes place at 28°C and 95.7 per cent relative humidity (Singh, 2004). The excessive use of plant protection chemicals to reduce the incidence of the disease has several disadvantages, particularly the higher cost of cultivation and residual toxicity of the chemicals in the produce which has a deleterious effect on human health at the same time polluting the environment to a significant extent. Even though biological control was conceptually good, it is not very much effective under high input conditions. Therefore, it is imperative to concentrate on the development of cultivars that are genetically resistant to disease.

In any breeding programme high yield along with disease resistance is the ultimate aim. But yield being a complex trait, which is decided by the result of interaction between a number of plant characters among themselves as well as with the environment, it is necessary to analyze the

association existing between the yield and yield components with anthracnose disease incidence. The inherent potential of a genotype to impart resistance is determined by the resistance mechanism operating within it. It depends primarily on the nature and magnitude of gene action involved in the expression of disease resistance. The biometrical methods have led to the formulation of a number of statistical procedures for the genetic analysis of disease resistance which provides information on nature of gene action. The present study was undertaken to identify a hybrid with high yielding and resistance to fruit rot disease.

Review of literature

The first report on fruit rot of red pepper was from America (Halstead, 1890). In India, it was first registered in Madras Presidency by Sydow (1913) who reported the causal organism as *Vermicularia capsici* Syd. (Syn. *Colletotrichum capsici* (Syd.) Butler and Bisby). Among the 20 entries in INTHOPE 5 evaluated for anthracnose reaction, incidences of fruit infection in PBC 559 and PBC 743 were significantly lower than all other entries (Anon., 1995). Among the 20 entries in ICPN 6, Tabasco L–167, MC–003, Kulai and PBC 367 with 0.2, 2.5, 8.0 and 11.6 per cent diseased fruit, respectively, had a significantly lower percentage of affected fruits than all other entries (Anon., 1996). In Dapoli, the varieties LCA 304, BC 24 and BC–14–2 showed moderate resistance and the varieties Arka Lohit, Jayant, Phule–C–5 and X–235 were resistant to the pathogen (Fugro *et al*., 1997).

In Tamil Nadu Agricultural University, Ruth Beulah Rani (2002) screened 93 genotypes against anthracnose in the field, and found that none were found to be immune. Three single plant selections namely Sln 1, Sln 2 and Sln 3 made in advanced generations of a hybrid, were found to be resistant with the PDI values 3.48, 4.12 and 4.14, respectively. The genotypes Arka Lohit (PDI-9.93), Pepper Hot (PDI-16.10), Ujwala (PDI-22.13), KDC 1 (PDI-23.33), CC 4 (PDI-23.55), CA 95 (PDI-23.80), CA 115 (PDI-24.13) and CA 59 (PDI-25.77) were found to be moderately resistant. Among the different hybrids, Sln 2 x CC 4 and Sln 1 x Ujwala were found to be resistant showing the PDI values of 1.55 and 2.81, respectively under natural epiphytic conditions.

Malathi (2004) evaluated twelve hybrids and their seven parents were evaluated for yield and anthracnose resistance in three different seasons during 2002-03. The disease resistance in the parent S1 showed its superiority followed by S 2, Arka Lohit and CC-4. Among the hybrids, the least PDI of 3.02 per cent was recorded in the hybrid S 1 x Ujwala followed by CC-4 x S 2 (3.27 per cent) and PDI of the top two best hybrids, Ujwala x S 1 and S 1 x CC-4 were 9.06 and 11.60 per cent respectively.

The total phenols increased in resistant chilli genotypes and decreased in susceptible genotypes after infection by *Xanthomonas vesicatoria* (Thind *et al*., 1981). Rajan (1985) observed a negative correlation between resistance and total phenol content in tomato and inferred that lower levels of phenolics in roots of resistant variety may be due to the increased rate of oxidation of phenolics.

Decrease of phenolic compounds with the maturity of the chilli fruits which became nil in the ripe chilli fruits had a direct correlation with the severity of the disease and the reaction of the chilli fruit tissues (Azad, 1991).

Studies conducted at Jorhat revealed that the phenol content of local fruit rot resistant chilli variety, Krishna was found to be significantly higher. For the susceptible variety Pusa Sadabahar, the phenol content was observed to decrease in infected fruits. On the other hand, in another susceptible variety Pusa Jwala, there was post-infectional increase in phenol content in the red ripe fruits (Borua and Das, 2000).

Ruth Beulah Rani (2002) reported that the resistant and moderately resistant genotypes under field conditions were found to be significantly superior with respect to total phenol as well as OD phenol content. The total phenol and OD phenol content in healthy and infected leaves and fruits of susceptible check, CHD 8 showed lesser values when compared to other genotypes (Malathi, 2004).

Increased activity of polyphenol oxidase was reported in leaves of two resistant varieties of *Capsicum annuum*. Upon infection with the pathogen, the activity of the enzyme increased significantly in resistant varieties, which in turn led to the formation of more quinones and other oxidation products, resulting in reduced multiplication and inactivation of the pathogen (Singh and Singh, 1989).

Materials and methods

Ninety three genotypes from the Germplasm, which had been maintained through continuous selfing at the Department of Vegetable Crops were used for anthracnose screening study. These

lines were evaluated both under field conditions and through artificial inoculation. Three single plant selections namely Sln 1, Sln 2 and Sln 3 made in advanced generations of a hybrid were found to be resistant and the genotypes Arka Lohit, Pepper Hot, CA 97, KDC 1, CC 4, CA 95, CA 115 and CA 59 were found to be moderately resistant. These eight selected lines (later) were used both as male (testers) and three as female parents (lines) (former) and 30 hybrids were obtained. All these hybrids were tested for the performance of yield, quality and disease resistance. The disease resistance was recorded based on the score chart suggested by Bansal and Grover (1969) as furnished below.

Grade	Amount of disease Percentage of Disease Index (PDI)	Reaction
0	No infection	Immune
1	1 – 5 % disease	Resistant
2	6 – 25 % disease	Moderately resistant
3	26 – 50 % disease	Susceptible
4	51 –100 % disease	Highly susceptible

After evaluation, two promising hybrid combinations were adjudged as resistance to anthracnose. The performance of these hybrids was tested along with resistant (Arka Meghana) and susceptible check (CHD 8). The hybrid combination Sln 1 X CA 97 was found superior over CA 97 x Sln 1. The performance of this hybrid was test verified at different research stations in MLT and at farmer's field in ART. The results on the bio metrical characters, disease reaction to anthracnose and quality were recorded.

Result

The results on the biometrical observations are presented in the tables 1 & 2. Among the direct crosses, the mean performance of the fruits per plant varied from 118.4 (Sln 3 x CC 4) to 200.9 (Sln 2 x CA 97). Among the reciprocal crosses, the values ranged from 123.7 (Pepper Hot x Sln 3) to 235.9 (CA 97 x Sln 1). Among the direct crosses, dry fruit yield ranged from 48.7 g in Sln 3 x Pepper Hot to 170.1 g in Sln 1 x Pepper Hot. Among the reciprocal crosses, it ranged from 49.95 g in Pepper Hot x Sln 3 to 180.41 g in Pepper Hot x Sln 2, followed by 170.32 g (CC 4 x Sln 2) and 15.55 g (Pepper Hot x Sln 1). The hybrid Sln 3 x CA 97 possessed the highest ascorbic acid content (273 mg/100 g) while the cross combination Sln 3 x CC 4 had the lowest content (97.5 mg / 100 g) among the direct crosses. Among the reciprocal crosses, the values ranged from 78.00 (Arka Lohit x Sln 1 and CA 97 x Sln 3) to 204.8 mg/100 g (CA 97 x Sln 2). Among the direct cross hybrids, the per cent of disease index ranged from 1.55 % in Sln 2 x CC 4, followed by 2.81 % in Sln 1 x CA 97 which were resistant, to 60.78 % in Sln 3 X Arka Lohit which was highly susceptible. Among the reciprocal hybrids, the least disease incidence was recorded in CC 4 x Sln 2 (5 %) which was resistant and highest incidence if 47.36 % was noted in KDC 1 x Sln 3, a susceptible hybrid.

Based on the above results, the hybrid combination Sln 1 x CA 97 was selected for further evaluation. The performance of the hybrid was evaluated along with the reciprocal cross CA 97 x Sln 1 and a resistant check Arka Meghana and a susceptible check CHD 8 during 2006-07. The performance of the hybrids and checks are presented in the table 3 & 4.

The results revealed that the hybrid CA 97 x Sln 1 recorded the highest fruits per plant (235.3), green fruit yield (890.6 g/plant), dry fruit yield (183.3 g/plant), ascorbic acid (128.8 mg/100 g), capsaicin content (0.63 %). While the hybrid Sln 1 x CA 97 recorded the green fruit yield of 725.0 g/plant, dry fruit yield of 146.7 g/plant and the capsaicin content of 0.75 %. When compared with anthracnose resistance the hybrid CA 97 x Sln 1 falls in the category of Moderately resistance (PDI – 8.0) while Sln 1 x CA 97 falls in the category of Resistant (PDI – 2.2). The parents CA 97 and Sln 1 recorded the PDI of 18.0 (moderately resistant) and 4.8 (resistant) respectively. Arka Meghana recorded the PDI of 1.3 (resistant).

Though the yield of the hybrid Sln 1 x CA 97 was less when compared to the CA 97 x Sln 1, based on the performance of the disease reaction, the hybrid Sln 1 x CA 97 (CCH 1) has been selected for testing under ART and MLT along with K 1 and NS 1701 a private company hybrid as checks. The performance of the hybrid was presented in the Table 4. The results revealed that the highest no. of fruits / plant (403), fresh fruit yield (29.56 t/ha), dry fruit yield (6.54 t/ha) was recorded in Sln 1 x CA 97. While the check NS 1701 recorded the green fruit yield of 26.54 t/ha and dry fruit yield of 5.17 t /ha. The fruit rot incidence of 9.70 % recorded in the hybrid Sln 1 x CA 97, 26.50 % in NS 1701 and 26.09 % in K1. In MLT conducted in more than 100 locations across Tamil Nadu, the mean performance (table 5) revealed that the hybrid out yielded the check with respect to yield and disease resistance.

The overall performance of the hybrid was presented in the table 6. The hybrid Sln 1 x CA 97 was named as CCH 1. The results revealed that green fruit yield was 14.65 % increase over NS 1701 and 51.40 % increase over K1. When compared the dry fruit yield the hybrid CCH 1 recorded 19.15 % increase over NS 1701 and 60.86 % increase over K 1. The reaction of chilli hybrid

CCH 1 against fruit rot disease was presented in the Table 7. The CCH 1 recorded the Percentage of Disease Index of 12.50 which falls in the category of moderately resistant.

Salient features of the hybrid CCH 1

Parentage	Selection 1 x CA 97
Duration	195-205 days
Season	June - July, September-October and January – February under irrigated conditions
Yield	Green fruit yield : 28.10 t/ha Dry fruit yield : 6.74 t/ha
Varieties compared and the percentage of increase in yield over the control	NS 1701 and K 1 were compared and the per cent increase was 14.65 and 51.40 for green fruit yield and 19.15 and 60.86 for dry fruit yield over NS 1701 and K 1 respectively.
Fruit characters	Fruits are smooth, elongated, tapering towards the tip and 10.5-12 cm long. Unripe fruits are green in colour and ripe fruits are wrinkle free and bright red in colour. The capsaicin content was 0.58 % and the oleoresin content was 14.0 %. Ascorbic acid content was 120 mg/100 g fruit.
Disease resistance	Moderate resistance to fruit rot disease (Percentage of Disease Reaction : 12.0)
Pest reaction	Susceptible to major pests
Special features	Plants are semi tall, spreading and highly branched. Fruits are smooth, elongated, tapering towards the tip and 10.5-12 cm long. Unripe fruits are light green in colour. Ripe fruits are bright red in colour.
Remarks	Released as TNAU Chilli Hybrid CO 1 by the state variety release committee during the year 2010

References

Anonymous. 1995. Evaluation of *Capsicum* accessions for resistance to anthracnose and *Phytophthora* blight. AVRDC 1995 Report, p. 57.

Anonymous. 1996. Host resistance to anthracnose of pepper. AVRDC 1996 Report, pp. 59 – 60.

Azad. 1991. Fate and role of chemical constituents of chilli fruits during infection with *Colletotrichum capsici*. Indian Phytopath., 44: 129 – 131.

Bansal, R.D. and R.K. Grover. 1969. Reaction of chilli *(Capsicum frutescens)* varieties to *Colletotrichum capsici*. J. Res. Punjab Agric. Univ., 6: 345 – 348.

Borua, I. and P. Das. 2000. Changes in activities of polyphenol oxidase, acid phosphatase and phenol content in developing chilli varieties susceptible and resistant to *Colletotrichum capsici*. Crop Res., 19(2): 230 – 234.

Durairaj, V. 1972. Fruit rot diseases of chillies. Farm and Factory, 6: 31 – 34.

Fugro, P.A., V.H. Patil and U.K. Sawant. 1997. Evaluation of chilli varieties for resistance to bacterial wilt and dieback diseases. J. Mycol. Pl. Path., 27(1): 102.

Halstead, B.D. 1890. Report of the Botanical Department. N.J. Agr. Exp. Sta. Rept., 11: 358 – 360.

Malathi, G. 2004. Genotype and seasonal interaction of F_1 hybrids and their parents in chilli (*Capsicum annuum* L.) for anthracnose resistance and high yield. Ph. D., (Hort.) Thesis, Tamil Nadu Agric. Univ., Coimbatore, India.

Rajan, S. 1985. Selection, efficiency and genetic and biochemical basis of resistance to bacterial wilt in tomato. Ph. D., Thesis, Kerala Agric. Univ., Vellanikkara, Thrissur.

Ruth Beulah Rani, A. 2002. Studies on the development of F_1 hybrids in chilli (*Capsicum annuum* L.) with high yield and resistance to anthracnose disease. Ph. D., (Hort.) Thesis, Tamil Nadu Agric. Univ., Coimbatore, India.

Singh, M.J. and J. Singh. 1989. Mechanisms of resistance to cucumber mosaic virus in chilli pepper (*Capsicum annuum* L.) I. Role of phenols and phenologies. EUCARPIA VII meeting on Genetic and Breeding on Capsicum and Egg plant. Yugoslavia, pp. 193 – 203.

Singh, R.S. 2004. Plant diseases. Mohan Primlani for Oxford and IBH Pub. Ltd., pp. 450 – 452.

Sydow, H. 1913. *Vermicularia capsici.* Ann. Mycol. Berl., 11: 329.

Thind, B.S., B.S. Sharma and N. Singh. 1981. Changes in sugars, amino acids and phenols in chilli leaves (*Capsicum annuum* L.) in response to *Xanthomonas vesicatoria* infection. Indian J. Mycol. Pl. Path., 11: 207.

Table 1. Performance of the hybrids for yield, quality and anthracnose resistance (2004-05) (Direct cross)

Hybrids	Plant height (cm)	Branches / plant	Fruits / plant	Green fruit yield / plant (g)	Dry fruit yield / plant (g)	Ascorbic acid mg / 100g	Capsaicin content %	PDI for anthrac nose
Sln 1 x Arka Lohit	66.8	7.7	173.7	237.4	92.3	136.5	0.48	26.7
Sln 1 x CC 4	88.0	14.7	155.4	653.2	170.9	175.5	0.75	11.0
Sln 1 x KDC 1	57.1	9.7	160.9	382.8	108.9	136.5	0.38	33.1
Sln 1 x Pepper Hot	66.7	10.0	197.3	650.5	170.1	175.5	0.49	26.9
Sln 1 x CA 97	73.2	12.7	170.1	513.2	131.7	195.0	0.78	2.8
Sln 2 x Arka Lohit	89.3	14.7	168.9	577.7	135.7	165.8	0.54	11.9
Sln 2 x CC 4	76.2	9.2	169.8	359.8	99.7	156.0	0.75	1.6
Sln 2 x KDC 1	57.2	11.0	196.5	291.1	93.4	156.0	0.57	13.9
Sln 2 x Pepper Hot	71.3	10.5	184.5	507.3	141.7	117.0	0.87	12.9
Sln 2 x CA 97	60.1	10.8	200.9	406.6	109.0	117.0	0.80	16.2
Sln 3 x Arka Lohit	64.0	7.0	139.4	220.7	59.9	107.3	0.31	60.8
Sln 3 x CC 4	68.0	7.3	118.4	188.2	59.4	97.5	0.72	16.7
Sln 3 x KDC 1	54.0	10.0	167.9	299.4	75.3	175.5	0.58	8.0
Sln 3 x Pepper Hot	62.0	7.5	119.4	210.6	48.7	214.5	0.37	36.7
Sln 3 x CA 97	50.1	9.0	129.1	240.1	59.7	273.0	0.47	28.6

Table 2. Performance of the hybrids for yield, quality and anthracnose resistance (2004-05) (Reciprocal cross)

Hybrids	Plant height (cm)	Branches / plant	Fruits / plant	Green fruit yield / plant (g)	Dry fruit yield / plant (g)	Ascorbic acid mg / 100g	Capsaicin content %	PDI for anthra cnose
Arka Lohit x Sln1	69.0	8.17	154.4	309.7	72.70	78.0	0.410	26.66
CC 4 x Sln1	61.4	11.50	135.8	417.8	121.13	97.5	0.533	11.86
KDC 1 x Sln1	57.0	7.50	149.3	203.0	64.86	117.0	0.380	60.78
Pepper Hot x Sln1	91.0	16.00	149.1	548.4	135.50	175.5	0.710	10.95
CA 97 x Sln1	64.5	12.17	235.9	378.5	123.73	195.0	0.595	1.55
Arka Lohit x Sln2	67.0	8.83	175.6	346.3	97.86	107.3	0.540	16.66
CC 4 x Sln2	81.4	13.00	221.4	672.3	170.32	117.0	0.800	33.14
KDC 1 x Sln2	70.0	10.50	192.6	434.5	126.21	156.0	0.531	13.87
Pepper Hot x Sln2	75.0	9.50	169.4	622.9	180.41	117.0	0.790	8.00
CA 97 x Sln2	71.0	11.33	227.1	532.1	90.90	136.8	0.613	26.88
Arka Lohit x Sln3	50.8	8.50	156.9	225.0	57.46	117.0	0.593	12.88
CC 4 x Sln3	69.8	7.50	133.8	212.7	58.56	97.5	0.409	36.66
KDC 1 x Sln3	53.4	8.50	127.2	217.5	52.07	97.5	0.342	2.81
Pepper Hot x Sln3	53.4	6.25	123.7	164.3	49.95	204.8	0.493	16.22
CA 97 x Sln3	63.0	9.25	147.3	275.0	85.40	78.0	0.508	28.55

Table 3. Performance of the selected hybrids for yield, quality and anthracnose resistance (2006-07)

Hybrids	Fruits / plant	Fresh fruit weight (g)	dry fruit weight (g)	Green fruit yield / plant (g)	Dry fruit yield / plant (g)	Ascorbic acid mg / 100g	Capsaicin content %	Percentage of Disease Index
CA 97 x SLN 1	235.3	2.03	0.61	890.6	183.3	128.8	0.63	8.0 (MR)
SLN 1 x CA 97	179.8	1.99	0.58	725.0	146.7	122.8	0.75	2.2 (R)
CA 97	135.8	2.06	0.54	435.0	87.7	118.1	0.64	18.0 (MR)
SLN 1	129.2	1.58	0.51	465.4	93.6	120.6	0.61	4.8 (R)
Arka Meghana*	86.0	2.89	0.72	612.3	123.5	121.3	0.70	1.3 (R)
CHD 8**	94.1	2.12	0.64	425.3	84.6	116.4	0.55	37.8 (S)

*** Resistant check**

**** Susceptible check**

Table 4. Performance of chilli hybrid CCH 1 under MLT during 2008 – 09

Centre	No. of fruits/plant			Green fruit yield (t/ ha)			Dry fruit yield (t/ha)			Fruit rot incidence %		
	CCH 1	NS 1701	K 1	CCH 1	NS 1701	K 1	CCH 1	NS 1701	K 1	CCH 1	NS 1701	K 1
T&CRS, Yethapur	410	359	306	30.89	27.78	18.00	6.67	5.31	3.86	3.20	22.00	15.00
VRS, Palur	415	365	320	32.22	27.56	20.22	6.78	4.89	4.18	8.00	22.40	20.90
AC & RI, Madurai	410	360	310	29.33	26.22	19.78	6.78	5.25	3.92	-	-	-
HC&RI, Periya kulam	402	358	305	31.11	27.50	21.11	6.67	5.33	4.11	12.50	28.90	20.35
HRS, Pechiparai	385	340	310	27.78	26.67	19.11	5.56	4.44	4.00	15.50	35.00	38.50
RRS, Vridhachalam	386	320	300	25.56	22.22	17.78	6.33	5.22	4.27	3.20	26.70	29.80
AC & RI, Killikulam	415	364	324	30.00	27.78	21.56	7.00	5.76	4.44	15.80	23.90	32.00
Mean	**403**	**352**	**311**	**29.56**	**26.54**	**19.65**	**6.54**	**5.17**	**4.11**	**9.70**	**26.50**	**26.09**

Table 5. Performance of CCH 1 in different districts of Tamil Nadu during 2008-09

		No. of fruits/plant			Green fruit yield (t/ha)			Dry fruit yield (t/ha)			Fruit rot incidence %		
	No. of Trials	CCH 1	NS 1701	K 1	CCH 1	NS 701	K 1	CCH 1	NS 1701	K 1	CCH 1	NS 1701	K 1
Madurai	3	429	331	295	15.48	14.52	13.04	3.04	2.74	2.67	1.48	13.45	14.44
Kancheepuram	5	399	338	286	25.08	19.87	17.68	6.83	6.04	4.84	5.64	12	13.72
Krishnagiri	4	396	339	284	26.66	24.45	19.2	6.73	5.67	4.63	6.5	16.01	14.73
Thanjavur	5	381	309	269	25.78	23.15	20.65	6.18	5.13	4.12	6.13	13.56	14.48
Thoothukudi	5	183	162	140	21.43	18.34	14.74	5.51	4.23	3.71	2.72	5.97	6.43
Coimbatore	20	396	336	282	26.85	24.38	15.76	7.33	6.07	5.04	6.4	12.59	15.57
Theni	8	357	303	283	21.18	18.89	15.67	4.75	3.75	3.15	1.23	4.88	8
Salem	8	399	344	310	29.58	25.58	20.36	6.69	5.19	4.04	1.77	10.63	12.7
Trichy	15	416	338	295	28.12	25.24	22.54	6.79	5.6	4.5	6.02	14.79	15.8
Dharmapuri	20	378	326	278	28.75	24.39	20.89	7.24	5.94	5.19	1.2	12.09	13.19
Thiruvannamalai	8	407	335	292	28.89	24.94	21.78	7.17	5.59	4.85	3.15	15.99	15.91
Mean	**101**	**376**	**315**	**274**	**25.25**	**22.16**	**18.39**	**6.21**	**5.09**	**4.25**	**3.84**	**12**	**13.18**

Table 6. Overall performance of chilli hybrid CCH 1

Particulars	No. of trials	Green fruit yield per hectare (t)		
		CCH 1	NS 1701	K 1
HC & RI, Coimbatore	12	29.50	24.83	17.65
MLT	7	29.56	26.54	19.65
ART/OFT	101	25.25	22.16	18.39
Mean	**-**	**28.10**	**24.51**	**18.56**
Per cent increase over	**-**		**14.65**	**51.40**

Particulars	No. of trials	Dry fruit yield per hectare (t)		
		CCH 1	NS 1701	K 1
HC & RI, Coimbatore	12	7.48	6.71	4.21
MLT	7	6.54	5.17	4.11
ART/OFT	101	6.21	5.09	4.25
Mean	**-**	**6.74**	**5.66**	**4.19**
Per cent increase over	**-**		**19.15**	**60.86**

Quality parameters

Hybrid	Capsaicin content (%)	Oleoresin content (%)	Ascorbic acid (mg/100g)
CCH 1	0.58	14.00	120.0
NS 1701	0.52	14.25	118.5
K 1	0.45	13.25	115.9

Table 7. Reaction of chilli hybrid CCH 1 against fruit rot disease

Hybrids/ Check	Percent of disease infection	Grade	Reaction
CCH 1	12.50	2	Moderately resistant
NS 1701	26.79	3	Susceptible
K 1	30.08	3	Susceptible

Grade scale 0 to 4