

## Impact of 'Co' canes in Andhra Pradesh

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Sugarcane is an important commercial crop of Andhra Pradesh grown in an area of 1.96 lakh hectares under varied situations with a production of 155.84 lakh metric tonnes and cane productivity of 79.51 metric tonnes per hectare (2012-13). Research work on development of improved sugarcane clones different maturity groups possessing high juice sucrose and suitable for different agro-climatic conditions in the state is being carried out at Anakapalli, Vuyyuru, Rudrur and Perumallapalle centres in the state.

Outbreak of red rot in an epi-phytotic form during 1895 in Godavari Delta (then in Madras state, now in Andhra Pradesh) caused serious irrecoverable loss to the farmers but resulted in the initiation of sugarcane research in 1902 on the lands of the present seed multiplication and adoptive research farm, Samalkot (Andhra Pradesh) led to the establishment of Sugarcane Breeding Institute, Coimbatore in 1912 and the development of sugarcane hybrids which could withstand red rot.

Sugarcane Research Station established at Anakapalle during 1913 is one of the oldest research station in Andhra Pradesh. It served as sugarcane research station for the composite Madras states also. 'Co' clones selected based on superiority for cane yield and quality helped to extend the cane area and increase production of cane, sugar and jaggery. The clones with appropriate cultural and manurial schedules helped to increase the cane yields by about 50 t/ha. Sugarcane Research Station, Anakapalle continues to be the lead station for Sugarcane Research in Andhra Pradesh.

Sugarcane research was started in the Telengana region of Andhra Pradesh at Rudrur in 1937. Sugarcane research was initiated for Rayalaseema region at Perumallapalle in Chittoor district in the year 1962 and at Vuyyuru in Krishna district, in the year 1978.

### *Sugarcane Research prior to the introduction of Co canes*

Initial studies were confined to testing of Javanese, Barbados and Mauritius clones. Prior to the popularization and spread of Co canes till 1927, 'J-247', 'B-208', 'Java Hebbal' in the Visakhapatnam district, Purple Mauritius, 'J-247', 'B-208', 'Java Hebbal' and 'Red Mauritius' in Godavari delta; 'Java Hebbal', 'J-247', 'Red Mauritius' and 'Tella Cheruku' in Chittoor District; 'Pundya', 'Namala Cheruku' and 'Dasari Cheruku' in Nizamabad district were under extensive cultivation.

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### *Introduction of 'Co' clones*

During 1922, 'Co' canes were introduced at SRS, Anakapalle for growing in specimen plots to show to the students in the Agricultural Middle School that new varieties can be developed by making inter specific crosses. Simultaneously, comprehensive studies in screening the varieties were also taken up. At Samalkot, varieties of promising selections at Sugarcane Breeding Institute, Coimbatore were received for the first time in 1930 and a comprehensive study of varieties was started from 1932 onwards.

Selected clones at Coimbatore were received at Anakapalle, for testing and selection of useful clones. All the clones received were tested under two set of conditions viz., restricted and normal irrigated and nutrient applied conditions. From 1929-30 till 1946-47, the trend in the performance of clones under both the set of conditions was found to be practically similar and hence testing of clones under normal conditions was taken up in subsequent years. Clones were classified into different maturity groups based on juice quality recorded during December, February and March. From 1965-66 onwards clones were tested in selection nursery for one year. Based on juice quality recorded in December, the clones were classified as early, mid and late maturing clones. (Table 1)

The first Coimbatore cane 'Co 213' released during 1928 was most widely cultivated in the state. From then on till about 1936, it was cultivated widely. There was a large increase in cane area due to popularization of varieties viz., 'Co 213' and 'Co 313' leading to establishment of sugar factories at Bobbili and Etikoppaka. Varieties viz., 'Co 213' and 'Co 243' were distributed for commercial cultivation to Krishna District.

One irrigation at planting and none later was the claim at Anakapalle Research Station during the early thirties of 20th century for raising of successfully a sugarcane crop using the newly released hardy varieties from Coimbatore. This claim was proved a practical reality in undivided Visakhapatnam district in which there was a large increase in cane area due to popularization of the varieties viz. 'Co 213' and 'Co 313'. Due to fairly even distribution of the annual rainfall of about 1000 mm in both the monsoons from June to end of October as also some rain in hot weather period, sugarcane cultivation became possible even without assured irrigation sources with hardy drought resistant Coimbatore varieties recommended from Anakapalle. With increase in cane area even without assured irrigation, sugar factories were established in 1933 in

Table 1. 'Co' Canes introduced in Andhra Pradesh till 1970

Variety	Parentage	Year of release	Maturity group
'Co 213'	PoJ 213 x Co 291	1926	Mid season variety
'Co 243'	A2 x Co 206	1934	Early season variety
'Co 281'	PoJ 213 x Co 206	1934	Early season variety
'Co 323'	Co 213 x Co 244	1934	Early season variety
'Co 419'	PoJ 2878 x Co 290	1936	Late season variety
'Co 421'	PoJ 2878 x Co 285	1936	Mid season variety
'Co 449'	PoJ 2878 x Co 331	1946	Mid season variety
'Co 527'	Co 349 x Co 312	1946	Early season variety
'Co 997'	Co 683 x P 63/32	1959	Early season variety
'Co 975'	Co 527 x Co 617	1960	Mid season variety
'Co 62175'	Co 951 x Co 419	1968	Late season variety

Etikoppaka village and in 1935 in Bobbili in the then Visakhapatnam district (Lakshmikantham 1973).

Under the conditions of only one irrigation, at planting and none later on, varieties 'Co 243' and 'Co 421' gave good yields of cane and became popular. Under swamp conditions from July to end of December, 'Co 281' and 'Co 285' gave good yields, but did not gain much foothold in many of the factory or gur areas. Variety 'Co 243' gained some popularity in Bobbili and Vuyyuru factory zones. In Telangana region, 'Co 213' and 'Co 290' became popular. The popularity of all these varieties including 'Co 213' began to wane after the introduction of 'Co 419' in 1936.

The "Wonder cane of Peninsular India" 'Co 419' was recommended for commercial cultivation in 1936 from Anakapalle after thorough testing by the Scientists of Sugarcane Research Station. The variety 'Co 419' recorded high cane yield of 136.46 t/ha and sugar yield of 17.07 t/ha with a percent sugar recovery of 12.51 (Bhupal Rao *et al*, 1991). At the All India Crop competitions, 'Co 419' bagged many first prizes for maximization of cane yield both in plant and ratoon crops in almost all the Southern States of India. This variety was extended to Northern belt of the Country where the agro-climatic conditions differ widely from that as cosmopolitan cane. As a general purpose cane of very high potentiality, 'Co 419' was unparalleled for about four decades even though it was released in 1936. It gave a maximum cane yield of 377.91 tonnes per hectare at about 13<sup>th</sup> month's age.

Variety 'Co 449' recommended for mid season crushing was noted to give 95.13 tonnes cane, 12.65 tonnes of sugar or 10.47 tonnes jaggery yield per hectare. The characteristic feature of the variety was its resistance to drought. Variety 'Co 975' released in 1960 was found to have out-yielded 'Co 449' in several trials at Anakapalle. Along with 'Co 419' the variety 'Co 421' also gained prominence in some of the factory areas like Bobbili due to its resistance to drought and good ratooning capacity. It lost ground due to its lower yield as compared to 'Co 449' and also due to its susceptibility to new strain of red rot fungus.

Adoption of varietal schedule was recommended from

Anakapalle especially in sugar factory areas. In 1943, the variety 'Co 527' was recommended for early crushing followed by 'Co 449' for mid season and 'Co 419' for late crushing. Due to very high tonnage, which 'Co 419' yielded in most of the places and in view of the payment of cane price on weight basis, varietal schedule did not spread to a very considerable extent in the state. However, some factories took the advice and encouraged cultivation of recommended varieties.

Variety 'Co 997' was identified from Anakapalle in 1959 to replace 'Co 527' as an opening mill cane. Variety 'Co 997' became popular because of its high juice quality coupled with excellent capacity to resist drought. The industry was benefitted to considerable extent by the spread of 'Co 997'. The maximum yield recorded from this variety was 264.38 tonnes per hectare. Variety 'Co 997' is a poorer yielder than 'Co 419' in terms of cane but in terms of sugar yield, especially in early stages of crushing, 'Co 997' excelled 'Co 419'. When crushed in December, 'Co 997' (13.20 t/ha) was noted to give higher estimated sugar yield than 'Co 527' (11.37 t/ha) and 'Co 419' (9.84 t/ha) at Sugarcane Research Station, Anakapalle. It went out of cultivation because of its susceptibility to red rot. Variety 'Co 997' was found as a unique clone in respect of its juice quality. Neither the seasonal nor other factors such as time of manuring, level of nitrogen manuring, time of planting and type of crop (Plant or Ratoon) affected the juice quality of the variety to any appreciable extent unlike in the case of 'Co 419'.

Variety 'Co 975' released as a mid-season cane unraveled as a variety with resistance to water logging.

Variety 'Co 419' gave birth to its baby 'Co 62175' (derivative of 'Co 419'). The rapid spread of this variety in other areas of the country is a proof that this variety was having a better genetic architecture than that of 'Co 419'. 'Co 62175' was found as a suitable substitute for 'Co 419' for late season crushing. During March at 12 months age, 'Co 62175' gave 21.56 tonnes of cane, 4.47 tonnes of estimated sugar and 3.36 tonnes of estimated jaggery more per hectare than 'Co 419'. It is not brittle like 'Co 419' and was noted to be less susceptible to smut. Its performance as a ratooner was found better than

Table 2. "Co" varieties introduced / released after 1970s

S.No.	Variety	Parentage	Year of release	Maturity group	Special features
1.	'Co 6907'	Co 740 x Co 1287	1979	Early	Suitable for moisture stress and water logged areas. Field resistant to red rot.
2.	'Co 7219'	Co 449 x Co 658	1978	Late	Suitable for ID, water logged and saline and alkaline conditions. Sucrose rich clone.
3.	'Co 7508'	Co 62174 GC	1981	early	Rich in the juice sucrose and shy tillering variety
4.	'Co 7706'	Co 740 x Co 775	1989	late	Resistant to Cf 419, 997, 671 patho types. Suitable for ID and water types logged conditions. Gives good quality jaggery.
5.	'Co 8014'	Co 740 x Co 6304	1989	Early	Suitable for ID conditions only. It is under cultivation in Telangana region.
6.	'Co 8013'	Co 740 x Co 6304	1996	Early	Resistant to Cf 419, 997, 671. suitable for ID and moisture stress areas
7.	'Co 8021'	Co 740 x Co 6806		Midlate	Resistant to Cf 419, 997 suitable for ID conditions
8.	'Co 7805'	Co 740 x Co 6806	-	Midlate	Suitable for ID & water logged areas. Delayed harvests and heavy fertilization
9.	'Co 86010'	Co 740 x Co 7409	-	Early	High cane and sugar yielder
10.	'Co 87025'	Co 7704 x Co 62198	-	Midlate	Non flowering clone. Suitable for mechanical harvesting.
11.	'Co 86032'	Co 62198 x Co C671	-	Midlate	High cane and sugar yielder. Tolerates drought and saline conditions. Occupies considerable area in Chittoor, Nellore and Telangana districts.
12.	'Co 86249'	Co 564 x Co A7601	1997	Midlate	Resistant for red rot

that of 'Co 419'. Therefore, 'Co 62175' was recommended to replace 'Co 419' as the standard late season cane under normal growing conditions under irrigated conditions. Variety 'Co 62175' released in 1968 to replace 'Co 419' gave 21.56 tonnes of cane, 4.47 tonnes of estimated sugar or 3.6 tonnes of estimated jaggery more per hectare than 'Co 419' during March at 12 months age. The maximum cane yield recorded by the variety by a farmer was 353.88 tonnes per hectare.

In 1978, variety 'Co 6907' was found suitable for early crushing at Rudrur. It was noted to give 115.22 tonnes of cane, 13.53 tonnes of jaggery or 15.37 tonnes of sugar yield per hectare. The variety was accepted by the farmers and occupied sizeable area in the coastal districts of Andhra Pradesh. Its main defect is susceptibility to smut with the result, the ratoon yields are found to be markedly lower than the yields of the corresponding plant crops. A few sugar factories in coastal districts could record a little over 11.0% sugar recovery for a few days when this variety is crushed.

Variety 'Co 6907', irrespective of the month of planting gave a little over 100 tonnes cane yield per hectare at 12 months age of crop at Anakapalle where the climatic conditions are favourable for good vegetative growth. Similarly, in areas where the climatic conditions are favourable for good accumulation of sugar, 'Co 6907' could register 100 tonnes cane yield per hectare with a little over 18% juice sucrose from June to September. It was found possible to maintain cane supply for a period of seven months in an year from

November to May by planting the variety 'Co 6907' from November to July and harvesting at its peak maturity at 10-14 months age of crop for higher cane (102-116 t./ha) and sugar (10-15 t/ha) yields. These findings lead to development of varieties which can be planted and harvested throughout the year

Variety 'Co 7508' with high juice sucrose inquiry group was identified at Anakapalle and recommended for commercial cultivation. But because of its poor stalk population coupled with poor ratooning ability, farmers have not taken up cultivation of this variety on a large scale. But, it was encouraged by the Sugar Industry for planting in June-July in Vizianagaram and Srikakulam districts.

Another early maturing variety 'Co 8013' selected at Vuyyuru, Krishna district with similar cane yields and juice quality as 'Co 6907' was found resistant to red rot and moderately resistant to smut, suitable for replacing Co 6907 in garden lands. In the studies conducted at Bobbili, 'Co 8013' gave a cane yield of 75.7 tonnes per hectare with one irrigation at planting and none later on. It went out of cultivation in K.G. Zone of the due to its susceptibility to wilt.

Variety 'Co 8014' identified at Rudrur gave 1.60 tonnes more sugar yield per hectare than 'Co 6907' and is under cultivation in Telangana region.

Variety 'Co 7219' identified in 1981 from Rudrur to replace 'Co 419' and 'Co 62175' was found to yield 123.77 tonnes cane yield, 14.54 tonnes jaggery yield and 13.74 tonnes sugar

yield per hectare. It is found to maintain juice quality late in the season also. It is accepted by the farmers and is under cultivation in a sizeable area throughout the State.

Variety 'Co 7706' is resistant to both smut and red rot diseases. 'Co 7706' a late maturing variety with high yield potential and resistant to red rot gives an excellent quality jaggery. It is the most preferred variety by the jaggery farmers of Visakhapatnam district.

'Co 7805' a mid late variety suitable for late planting and harvesting occupies maximum cane area in North Coastal, Central Coastal and South Coastal districts. It is suitable for delayed harvesting and heavy fertilization.

Mid late varieties 'Co 87044' and 'Co 8021' in Chittoor district and late maturing variety 'Co 8011' in Nizamabad district is under cultivation in small pockets. The area under the varieties of recent origin, viz., 'Co 86032' (Mid late) and 'Co 86010' and 'Co 91002', 'Co 91005' and 'Co 92020' (Early) is on the increase in Telangana and Coastal districts (Naidu 2011).

Some of the above said varieties thus released for commercial cultivation in the state have occupied large areas under sugarcane and improved the economic condition of the growers and stabilized the sugar/jaggery industry in the state.

'Co' clones selected based on superiority for cane yield and quality helped to extend the cane area and increase production of cane, sugar and jaggery. The clones with appropriate cultural and manurial schedule helped to increase

the cane yields by about 50 t/ha.

The average cane yield per hectare before the introduction of 'Co' canes was about 40 tonnes per hectare. It was increased to 70 tonnes per hectare with the spread of 'Co' canes coupled with adoption of field practices, the research findings of practical importance (Lakshmi Kantham 1987; Prasad Rao 1989).

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