



Research Article

CoPant 97222 – A High Yielding Mid Late Maturing Sugarcane Variety for North West Zone Areas

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(Received: 23 Jul 2013; Accepted: 23 Oct 2013)

Abstract

The variety CoPant 97222 was developed from open pollinated cross on cultivar CoPant 84212 at Sugarcane Breeding Institute, Coimbatore. It was evaluated against the check varieties Co 1148, CoS 767 and CoS 8436 for its performance under AICRP yield trials of North Western Zone from 2000-01 to 2003-04 in two plants and one ratoon crops at G. B. Pant Univ. of Agri.& Technology, Pantnagar. The clone CoPant 97222, recorded an average cane yield of 88.16 t/ha and sugar yield of 11.14 t/ha and thus found superior to the checks CoS 767 (72.70 and 8.81 t/ha) and (Co 1148 (78.27 and 9.23 t/ha) and CoS 8436 (71.33 and 8.88 t/ha) for cane and sugar yields respectively. The percent increase for cane yield t/ha of CoPant 97222 over checks CoS767, Co 1148 and CoS 8436 was 21.12, 12.78 and 23.80 respectively. The percent increase for sugar yield over checks also ranged from 21.17 to 26.00. Juice sucrose percent at harvest in CoPant 97222 was on par with CoS 767 and CoS 8436 but superior to Co 1148. The number of millable canes in CoPant 97222 were on par with CoS 8436 but cane length, cane diameter and cane weight were high in variety CoPant 97222 over the checks. This variety was resistant to Red rot under natural and artificial inoculated conditions. This variety CoPant had tall medium thick canes with erect growing habit and non lodging. It was released for cultivation in North Western Zone comprising of five states viz., Rajasthan, Haryana, Punjab, UP and Uttarakhand by Central Variety Release Committee, Government in the year 2006. This variety is performing excellent in the notified areas.

Key words: Sugarcane, cane yield, sugar yield, red rot.

Introduction:

Sugarcane is a major commercial crop that sustains sugar industry. India occupies the top most position in the world in area of 5.03 million hectares and also production of 342.20 million ton of cane with national average yield of 68.09 t/ha (2011-12) which is generally lower than several other countries. In sugarcane breeding it is well established that cane yield is ultimately has negative correlation with high sugar accumulation in plant. Therefore, it is obvious to increase the national sugarcane productivity by adopting mid-late maturing varieties in appropriate proportion with early maturing varieties. In most of the factory areas of North-west zone, a few mid late varieties are under cultivation which are suitable for this agro climate zone. Lack of suitable cane varieties might be one of the reasons for low productivity in the area. To meet the requirement of both the farmers and industries, it is desirable to identify suitable varieties for increasing productivity and sugar recovery with different maturity period for effective varieties scheduling in entire crushing period.

Farmers needs a genetically diverse portfolio of improved crop varieties, suited to a desired range of agro-ecosystem and farming practices and resilient to climate change. Hence, there is need to choose high yielding and high sugar content sugarcane varieties in mid late maturity group periodically to

replace the deteriorating commercial varieties. Sugarcane varieties showed a varied potential for yield and quality characters (Balasundaram and Bhagyalakshmi, 1978). Some clones have been reported to give higher number of tillers and millable canes, while others buildup their yield by the vigour of the individual cane via cane length and cane thickness (Rathore *et al.*, 1987). On the other hand in the task of selecting varieties with higher cane yield, one has to consider the interaction of various environmental factors which influence yield (Tyagi *et al.*, 2011).

In sugarcane, cane and sugar yields are the complex and important parameters for effective and sustainable growth of both farmers and sugar industries. With this view, continuous efforts are being made to develop and identify improved high yielding, good quality and disease resistant varieties at Crop Research Centre, Pantnagar University, Pantnagar.

Material and Methods

The clone CoPant 97222 was developed from on open pollinated cross on popular high sugar yielding variety CoPant 84211. The open pollinated fluff was collected in National Hybridization Garden at Sugarcane Breeding Institute, Coimbatore and seedling progenies were raised at Crop Research Centre, Pantnagar during 1991-92. In station clonal trials, this clone has showed good cane length

,higher cane thickness, cane weight and ultimately higher cane yield with other desirable characters of high tillering and disease resistance towards red rot compared to standard varieties. On the basis of these desirable characters showed by this clone in initial evaluation CoPant 97222 was proposed for further testing in zonal varieties trials of North-western zone and 2003-04 in two plants and one ratoon crops. Three standard varieties CoS 767, Co 1148 and CoS 8436 were included in trials for comparisons. Out of these three checks CoS 767 and Co 1148 are good cane yielder and CoS 8436 is a high juice quality check. . The experiment was laid out in Randomized Block Design with three replications. All the recommended package of practices was adopted for raising a good and healthy cane crop. Data were recorded on morphological characters viz., number of millable canes at harvest, length of cane, single cane weight and diameter of cane and juice quality viz., brix, sucrose, juice purity and commercial cane sugar percent as per the standard procedure (Meade and Chen, 1971). Cane yield was recorded at harvest on plot basis and expressed in tons/hectare; sugar yield was estimated based on cane yield and CCS %. Simultaneously, the cane quality characteristics of CoPant 97222 were also evaluated at two sugar mills in Uttar Pradesh and Uttarakhand viz., Mawana and Bejpur during the year 2004. Reaction to disease for red rot was recorded under natural and artificial conditions (Plug and Nodal methods). Statistical analysis of data was carried out as per Panse and Sukhatme (1978).

Result and Discussion

The data on morphological characters, cane yield, yield component, juice quality parameters and reaction to red rot are presented in Tables 1 to 5.

Cane yield: The variety CoPant 97222 recorded a higher mean yield of 88.16 t/ha in two plant crops and one ratoon crop compared to the checks CoS 767 (72.70 t/ha), Co 1148 (78.27 t/ha) and CoS 8436 (71.33 t/ha). The variety CoPant 97222 recorded significantly higher cane yield over the three check varieties. The per cent increase for cane yield of CoPant 97222 in two plant crop and ratoon against checks was 21.12, 12.76 and 23.80 respectively over CoS 767, Co 1148 and CoS 8436 (Table 2).

Sugar yield: CoPant 97222 produced an average sugar yield of 11.14 t/ha over two plants and one ratoon crops while the checks CoS 767, Co 1148 and CoS 8436 recorded an average sugar yield of 8.81 t/ha, 9.23 t/ha and 8.88 t/ha respectively (Table 3). The percent increase in sugar yield of CoPant 97222 over two plant and one ratoon crops was 26.00 (CoS 767), 21.17 (Co 1148) and 25.52 (CoS 8436).

Yield components: CoPant 97222 recorded better germination, tillering and millable cane formation with attractive canopy as well as good ratooning

under All India Coordinated Research Programme (AICRP) on Sugarcane of ICAR, New Delhi in 1997. Initially it was tested in Initial Varietal Trial (IVT) during 2000-01 and based on the better performance across nine locations in North West Zone, it was promoted for testing in Advanced Varietal Trial (AVT) from 2002-03 ability. This variety has recorded on par performance for number of millable canes (95 thousand/ha) as compared to CoS 767 (99 thousand/ha), Co 1148 (106 thousand/ha) and CoS 8436 (96 thousand). The variety CoPant 97222 has showed highest cane length (2.40 m) and cane diameter (2.42cm). For single cane weight, CoPant 97222 (1.03 kg) was superior to CoS 767 (0.86 kg), Co 1148 (0.89 kg) and CoS 8436 (0.88 kg) (Table 4).

Juice Quality Characteristics: Juice brix, sucrose, purity and CCS % were estimated to assess the cane quality at 300 days and 360 days stages in plant crops and at 330 days in ratoon crop. However average of juice quality data collected in plant crop at 360 days and 330 days in ratoon crop was alone presented (Table 5). The variety CoPant 97222 exhibited 16.08 % sucrose which was on par with check varieties CoS 767 (15.91), Co 1148 (15.49) and CoS 8436 (16.48) at 300 days. Juice purity (86.93 %) was comparable to the check varieties. At 360 days, sucrose per cent in CoPant 97222 was 18.19 which was on par with CoS 8436 (18.15) but superior compared to the other checks CoS 767 (17.42) and Co 1148 (17.12). Juice purity percent of CoPant 97222 at 360 days was 88.85 and almost equal to the other check varieties. In commercial cane sugar percent (CCS %), variety CoPant 97222 showed 10.92 (300 days) and 12.59 (360 days) at par with CoS 8436 (11.33, and 12.48) but higher than other two checks CoS 767 (10.83 and 11.97) and Co 1148 (10.51 and 11.74).

Reaction against disease and pest: Reactions of CoPant 97222 and checks varieties were studied for red rot disease under natural and artificially inoculated conditions. In natural condition, no incidence of red rot disease was reported. In artificial inoculated conditions, the variety CoPant 97222 has showed moderate resistance to red rot disease. No incidence of top borer, stem borer and shoot borer was observed in CoPant 97222 .

Based on the superior performance for can yield and other traits, the promising variety CoPant 97222 was found as promising. This variety has recorded good germination, synchronous tillering habit and exhibited good ratooning ability. The leaves are had loose clasping and easy for detashing. It showed erect, non-lodging growth habit with other desirable morphological characters. It is found to be suitable for planting in autumn, spring and late season after harvest of wheat in summer.



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Table 1. Morphological characters for Sugarcane Varietal Identification of CoPant 97222

| | | |
|--|---|----------------------------------|
| Clone member | : | CoPant 97222 |
| Shoot habit | : | Erect |
| Stem colour-exposed | : | Purplish grey |
| Stem colour-unexposed | : | Grayish dull green |
| Ivory marks | : | Absent |
| Weather marks | : | Absent |
| Internode shape | : | Cylindrical |
| Internode alignment | : | Straight |
| Pithiness | : | Absent |
| Splits on internode | : | Absent |
| Wax on the internode | : | Medium |
| Node swelling | : | Present |
| Root zone colour-exposed | : | Dull purple |
| Root zone colour unexposed | : | Creamy yellow |
| No. of root eyes | : | Two |
| Arrangement of root eyes | : | Regular |
| Bud size | : | Small |
| Bud shape | : | Oval |
| Bud cushion | : | Absent |
| Bud gempore position | : | Apical |
| Bud groove | : | Absent |
| Growth ring colour | : | Yellow-unexposed, purple-exposed |
| Leaf length (of 1 st transverse leaf at 180 days) | : | 128.0 cm (124.5-132.7) |
| Leaf width | : | 5.26 cm (4.6-5.8cm) |
| Lamina colour | : | Green |
| Leaf carriage shape | : | Dropping |
| Leaf sheath colour | : | Green but turns purplish later |
| Leaf sheath waxiness | : | Slight |
| Leaf sheath spines | : | Absent |
| Leaf sheath clasping | : | Loose |
| Dewlap colour (10 month) | : | Conspicuous dull green |
| Presence of absence of ligular process | : | Present |
| Shape of ligular process | : | Crescent form |
| Shape of auricles | : | Lanceolate |
| Percentage of flowering | : | NIL |



Table 2. Performance of CoPant 97222 in Advance Varietal Trials for cane yield (t/ha) (Year 2002-03 to 2003-04)

| Variety | Plant-I | Plant-II | Ratoon | Mean | % over check |
|--------------|---------|----------|--------|-------|--------------|
| CoPant 97222 | 90.87 | 97.54 | 76.08 | 88.16 | - |
| CoS 767 (C) | 77.65 | 73.59 | 66.87 | 72.70 | 21.12 |
| Co 1148 (C) | 80.67 | 87.44 | 66.69 | 78.27 | 12.76 |
| CoS 8436 (C) | 77.23 | 76.40 | 60.35 | 71.33 | 23.80 |

Table 3. Performance of CoPant 97222 in Advance Varietal Trials for sugar yield (t/ha) (Year 2002-03 to 2003-04)

| Variety | Plant-I | Plant-II | Ratoon | Mean | % over check |
|--------------|---------|----------|--------|-------|--------------|
| CoPant 97222 | 11.65 | 12.47 | 9.29 | 11.14 | - |
| CoS 767 (C) | 9.39 | 9.03 | 8.02 | 8.81 | 26.00 |
| Co 1148 (C) | 9.75 | 10.57 | 7.37 | 9.23 | 21.17 |
| CoS 8436 (C) | 9.60 | 9.72 | 7.32 | 8.88 | 25.52 |

Table 4. Performance of CoPant 97222 in Advance Varietal Trials for yield components (Year 2002-03 to 2003-04) over two plant and one ratoon crop.

| Variety | NMC at harvest (000/ha) | Length of cane (m) | Single cane weight (kg) | Diameter of cane (cm) |
|--------------|-------------------------|--------------------|-------------------------|-----------------------|
| CoPant 97222 | 95.41 | 2.40 | 1.03 | 2.42 |
| CoS 767 (C) | 99.56 | 2.22 | 0.86 | 2.23 |
| Co 1148 (C) | 105.90 | 2.28 | 0.89 | 2.19 |
| CoS 8436 (C) | 95.85 | 1.87 | 0.88 | 2.56 |

Table 5. Performance of CoPant 97222 in Advance Varietal Trials for juice quality parameters at harvest on 360 days (2002-03 to 2003-04)

| Characters | Variety | CoPant 97222 | CoS 767 (C) | Co 1148 (C) | CoS 8436 (C) |
|----------------------|----------------|--------------|-------------|-------------|--------------|
| Sucrose (%) | P ₁ | 18.25 | 17.29 | 17.44 | 18.12 |
| | P ₂ | 18.6 | 17.69 | 17.57 | 18.57 |
| | Ratoon | 17.73 | 17.29 | 16.36 | 17.75 |
| | Mean | 18.19 | 17.42 | 17.12 | 18.15 |
| Purity (%) | P ₁ | 89.16 | 87.88 | 87.15 | 87.67 |
| | P ₂ | 89.01 | 88.95 | 88.21 | 87.06 |
| | Ratoon | 88.38 | 87.46 | 84.98 | 87.01 |
| | Mean | 88.85 | 88.1 | 86.78 | 87.25 |
| CCS (%) | P ₁ | 12.65 | 11.74 | 12 | 12.54 |
| | P ₂ | 12.88 | 12.28 | 12.11 | 12.74 |
| | Ratoon | 12.25 | 11.88 | 11.1 | 12.17 |
| | Mean | 12.59 | 11.97 | 11.74 | 12.48 |
| Juice extraction (%) | P ₁ | 55.77 | 52.32 | 54.34 | 52.59 |
| | P ₂ | 53.67 | 52.3 | 52.5 | 53.42 |
| | Ratoon | 54.5 | 51.51 | 53.92 | 52 |
| | Mean | 54.65 | 52.04 | 53.59 | 52.67 |