



Original Research Article

Production Potential of Sugarcane Varieties and Constraints in Bihar

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ABSTRACT

Keywords

Sugarcane;
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Sugarcane being a vegetatively propagate crop, 12 to 14% of total cane production is used annually as seed material. A large quantity of good quality seed cane is required for improving the productivity. Among the various factors lowering down the production and productivity of sugarcane, the prevalence of major diseases are one of them. Several varieties have been developed and released for cultivation, but due to abiotic and biotic factors many commercial varieties have lost their potential in all respect. It is observed that cane yield is slightly increased (35.0 to 51.0 t/ha) during 2007 to 2011 and also increasing trends were observed in sugar recovery (8.65 to 9.60%). Hence, to maintain and increase in production potential for profitable cultivation effective management strategies, a comprehensive idea and healthy seed nursery programme should be adopted.

Introduction

Sugarcane occupies a commanding position as an agro-industrial crop of the country, with 5.2 million ha areas, whereas, in Bihar it is grown in an areas of 2.80 lakh hectare with production of 139.0 lakh tonnes and productivity of 50 tonnes/ha. Sugarcane grown under Bihar condition in which abiotic and biotic stresses generally limit its productivity. To overcome this vulnerable situation, plant breeders and pathologist are constantly on the search of genotypes that impart resistance for abiotic and biotic stresses during varietal development programme.

About 180 diseases reported in sugarcane from India due to which 10-15 per cent

Red rot, wilt, Smut, Sett rot, mosaic, grassy shoot, ratoon stunting diseases are occurring in Bihar. However, red rot is one of them, due to this disease reduction in Brix %, Sucrose % and purity % were observed. Due to red rot and smut causing out breaks in recent past years and 30-100 % yield loss and 25-75 % sucrose recovery in commercial sugarcane cultivars throughout India was observed (Viswanathan 2012). Minnatullah et al., (2012) also observed in response to red rot infection appreciable reduction ranging from 17.6 to 20.0 in brix, 16.8 to 23.4 % in pol and 19.0 to 23.1 % in purity. Many recently released superior varieties have succumbed to epidemics of red rot and removed from cultivation in different states (Viswanathan 2010).

Materials and Methods

To assess the disease status and varietal susceptibility of sugarcane diseases an extensive survey was conducted in different cane growing areas of Bihar i.e. Madhopur, Pusa, Hasanpur, Kalyanpur, Manjhaulia, Sugauli, Harinagar, Bagha and Narkatiyaganj to study the incidence of diseases during the cropping seasons 2008-13. Ten plots in each area were visited and observations were recorded on randomly selected hundred canes from four different locations at each plot to assess the incidence of the disease, which was calculated by using the following formula:

$$\text{Disease incidence (\%)} = \frac{\text{Number of affected canes}}{\text{Total number of cane assessed}} \times 100$$

Results and Discussion

Status in Bihar

Presently an increasing trend in respect of areas, yield and recovery were observed during the reporting year in Bihar which is summarized in Table – 1& 2.

Data in table-2 revealed that the area varied from 101 to 245.6 lakh hectares (2005-06 to 2010-11), the average cane yield varied from 42.25 t/ha to 51 .0 t/ha (2005- 06 to 2010-11) and sugar recovery ranged in between 8.65 to 9.65% respectively.

More than 55 sugarcane varieties have been released and recommended for commercial cultivation from SRI, Pusa out of which presently more than 10 varieties are under cultivation in different cane growing areas of Bihar. Among them, the varieties CoP 9301, CoP 9702, BO 146, Bo 139, BO 141, BO 1543, BO 154, CoP

2061 and CoP 112 getting more popularity among cane growers of Bihar. Once about 65% area in Bihar was occupied by this variety (Pandey *et al* 2007). Thus, varieties played a vital role in increasing cane productivity from 28.80 to 50.00 t/ha. The list of recommended varieties and production potential are cited below in Table – 3 & 4.

Varieties released for cultivation in Bihar by Central Varietal Release Committee (CVRC)

A good number of early and mid-late maturing varieties have been identified and released since 2000, with respect to cane yield, sucrose % and disease resistance as well as qualitative and quantitative parameters. There is need to exploit the potential of all these parameters for further improvement in the benefit of both cane growers as well as sugar mills.

To ascertain the disease position and varietal susceptibilities of sugarcane, an extensive survey was carried out in different cane growing areas of Bihar from May –December every month during 2008 to 2013. In general it is observed that the disease incidence was higher in the months of September to December as comparison to May to August. More than twenty sugarcane varieties were affected with red rot, smut, wilt, leaf spot, sett rot, mosaic, Pokkah boeng, red stripe and grassy shoot diseases during reported period. It is observed that the major diseases like red rot, wilt and smut varied from (2 to 20%) in different cane varieties. The minor diseases are also affected several varieties in different surveyed areas. However, the Pokkah boeng disease affects almost all varieties during last few years and its incidence varied from (2% to

20%) and rest diseases are observed under manageable situation in all cane growing areas of Bihar.

Major constraints

To mitigate the losses by abiotic and biotic factors and to improve the production potential of sugarcane varieties which is beneficial for farmers as well as sugar mills there is a need to focus on some important constraints.

Lack of sound seed programme

Most of the sugarcane diseases are soil as well as sett borne causing losses upto 15-20% which contributed in reduction of all parameters of cane. Only way to mitigate such losses there should be sound seed production programme for planting of healthy setts. Varieties having resistant to moderately resistant against diseases may be included in seed production chain.

Negligence of sett treatment

To protect the setts from sett borne and soil borne diseases the setts should be treated properly with recommended fungicide (carbendazim @ 0.1%) for 20-30 minutes before planting but cane growers are not following the treatment measures properly. Therefore, there is need to aware and popularize the sett treatment practices with chemicals as well as bio agents for a proper way.

Non-adoption of crop rotation and monoculture

Soil borne diseases can be manage by adopting the crop rotation with non-host crop and restrict to mono-culture of sugarcane over large areas to prevent the wide spread of inoculum and out breaks of epidemic of sugarcane diseases.

Lack of check on introduction of non-recommended varieties

It is observed that several varieties are being introduced in different cane growing areas of Bihar without recommendation and proper evaluation against diseases which increases the inoculum load and hampers several resistant varieties. Hence, there is need to restrict or evaluate such varieties prior to commercial cultivation in Bihar.

Lack of critical survey and monitoring of diseases

Sugarcane crops stands in the field for 12 months and whenever, the pathogen find congenial environment they infect the plants. To know the disease status and varietal susceptibilities of sugarcane, frequent vigilant towards survey and monitoring is essentially required so that within a period a suitable management strategies should be formulated and if required susceptible varieties must be replaced by resistant varieties for cultivation.

In conclusion, seed constitutes the most vital part for profitable cultivation in Agriculture it is the store house genetic potential of varietal productivity. A good number of varieties have been developed but many popular varieties have lost their yield potential and out from cultivation. The major constraints involved viz, diseases, draught, waterlogging, monocropping, poor quality seed materials and ill management practices. Therefore, for profitable cultivation and to maintain the production and productivity the importance of quality seed production of healthy and disease free seed is essential to enhance the production potential of sugarcane varieties and for profitable cultivation. In spite of all these, a strong

and close linkage between scientists, farmers, factories alongwith cane Department is essentially required for sustainable survival and achieving the dream of such sugar complexes.

Table.1 Area, production and productivity of sugarcane in Bihar

Period	Area (lac hectare)	Production (lac tonnes)	Productivity
1976-80	1.32	43.16	35.62
1981-85	1.21	39.19	32.38
1986-90	1.51	65.03	43.06
1990-95	1.70	95.00	53.07
1996-2000	1.13	50.95	44.90
2001-2005	1.05	44.24	42.30
2006-2010	1.14	48.28	42.46
2011-2013	2.52	127.30	50.25

Source: Indian Sugar-2014

Table.2 Area, productivity and sugar recovery % of Bihar

Parameter	Area (000'ha)	Cane yield (t/ha)	Sugar recovery (%)
Average	121.6	42.25	9.25
Range	101-245 (2005-06)-(2010-11)	35.0-51.0 (2007-08)-(2010-11)	8.65-9.60 (2006-07)-(2004-05)

Table.3 Recommended varieties for cultivation in Bihar

Maturity group	Varieties
Early	CoP 9301, BO 99, BO 130, BO 138, BO 1398, BO 145, BO 153, CoSe 95436, CoSe 98231, Co 87267, CoS 8436 and CoS 96268
Mid-late	BO 91, BO 110, BO 128, CoP 9302, CoP 9702, BO 136, BO 137, BO 147, BO 146, CoP 02061, CoSe 92423, CoSe 95422, CoS 767 and CoS 8432

Table.4 Popular Sugarcane varieties recommended for general cultivation in Bihar and their production potential

Sl. No.	Varieties	parentage	Year of release	Av. Cane yield (t/ha)	Sucrose % in Juice	Reaction to red rot disease	Incidence to insect pests
Early maturity group							
1	CoP 9301	CoP×BO 99	1996	83.00	17.30	MR	Low to medium
2	BO 130	BO × BO 43	1997	78.00	17.10	R	Low to medium
3	BO 139	BO 109× BO 43	2005	84.00	17.40	R	Low
4	BO 153	BO 131 self	2011	87.00	17.43	R	Low
5	CoP 112	BO 91× Co 62198	2014	96.50	17.48	R	Low

Midlate maturity group							
1	BO 91	BO 55×BO 43	1987	72.00	16.70	R	Low
2	CoP 9206	CoC 671×Co 1148	1995	82.00	17.00	MR	Low
3	CoP 9302	BO 91×Co 62174	1996	94.00	17.20	MR	Medium
4	CoP 9702	BO 99× NCO 310	2003	85.00	17.37	MR	Low
5	BO 141	BO 89 FC	2006	88.00	16.85	MR	Low to medium
6	BO 146	BO 128×BO 109	2008	92.00	17.50	MR	Low to medium
7	CoP 2061	CoK 8105×HR 6365	2011	98.00	17.40	R	Low
8	BO 154	CoSe 98225×UP 9742	2014	104.00	17.47	R	Low

Table.5 Varieties released for commercial cultivation for North Central and North Eastern Zone by CVRC

Name of variety	Year of release	Maturity	Cane yield (t/ha)	Sucrose (%)	Resistance to diseases
Co 87268	2000	Early	78.90	17.50	Red rot and Smut
Co 89029	2001	Early	70.60	16.30	Red rot
CoSe 95422	2001	Early	67.80	17.70	Red rot
CoSe 94234	2004	Early	64.10	17.90	Red rot
CoLk 94184	2008	Early	76.00	18.00	Red rot
Co 0232	2009	Early	67.82	16.51	Red rot, Smut and Wilt
CoSe 01421	2011	Early	65.87	17.36	Red rot, Smut and Wilt
BO 128	2001	Mid-late	69.20	17.60	Red rot and Smut
CoSe 92423	2001	Mid-late	70.10	17.50	Red rot and Smut
CoSe 96436	2004	Mid-late	67.10	17.70	Red rot and Smut
Co 0233	2009	Mid-late	67.77	17.54	Red rot and Smut

Table.6 Survey of sugarcane diseases naturally occurring in Bihar

Sl. No.	Varieties	May-June	July-August	September –October	November-December
1	CoS 91269	Smut (2-5%)	Pokkah boeng (5%) Red rot (2%)	PBD (10%), Red rot (5%), Wilt (5%)	PBD (15%), Red rot (10%) Wilt (10%)
2	BO 147	Smut (5%)	PBD (5%), Red stripe (2%)	PBD (15%)	PBD (20%)
3	CoS 8436, CoB 07427, CoB 07430 and CoBlN 07502	Smut (2%)	Pokkah boeng (2%) Wilt (10%), Red rot (4%)	PBD (5%), Red rot (5%)	PBD (5%), Red rot (10%) Wilt (20%)
4	CoSe 98231	Smut (3%), Sett rot (2%)	Red rot (2%)	Wilt (12%)	Red rot (10%), Wilt (10%)
5	Co 1148	Sett rot (2%)	Red rot (10%)	Red rot (5%), Wilt (5%)	Red rot (15%)
6	BO 128	Smut (10-12%)	Red rot (10%), GSD (5%)	Red rot (10%)	Red rot (20%), Wilt (25%)
7	CoS 8436	-	Red rot (5%)	Red rot (15%), Wilt (15%)	Red rot (20%), Wilt (20%)
8	Co 1158	Smut (10%)	Red rot (5%)	Red rot (10%), Wilt (5%)	
9	CoJ 64	Smut (5%)	PBD (2%), GSD (2%)	GSD (5%), PBD (5%)	GSD (5%) PBD (5%)
10	BO 146	Smut (2%)	PBD (2%)	PBD (5%)	PBD (6%)
11	BO 137	Smut (2%), Sett rot (5%)	PBD (2%)	PBD (5%)	PBD (10%)
12	CoS 8432	Smut (2%) Sett rot (5%)	GSD (2%)	GSD (5%), Top rot (2%)	Red rot (10%), Top rot (15%), GSD (5%)
13	BO 141	Smut (3%)	Wilt (2%)	Wilt (5%)	Wilt (5%)
14	Co 233	-	Wilt (5%)	Wilt (5%), Leaf spot (2%)	Wilt (10%), Leaf spot (5%)
15	BO 110	-	Wilt (5%) PBD (5%)	Wilt (5%), PBD (5%)	Wilt (10%), PBD (5%)
16	CoLK 94184	-	Wilt 10%)	Wilt (10%)	Wilt (15%)
17	CoPant 97222	-	PBD (2%)	Red stripe (2%), PBD (5%)	PBD (5%), Red Stripe (5%)
18	CoSe 95422	Smut (2%)	Red rot (5%) GSD (2%)	Red rot (5%), GSD (2%)	Red rot (15%), GSD (5%)
19	CoB 99161	Smut (2%)	Mosaic (2%)	Mosaic (5%)	Mosaic (10%)
20	CoSe 92423 and CoSe 93232	Smut (5%)	Red rot (5%), Wilt (5%)	Red rot (10%), Wilt (5%)	Red rot (15%), Wilt (15%)
21	CoB 07430 and CoSe 06436	-	Top rot (2-5%)	Top rot (5%)	Top rot (10-15%)

*PBD: Pokkah Boeng Disease and GSD: Grassy Shoot Disease

References

- Minnatullah, Md. Patel, A. K., Dohare, S. and Akhtar Reyaz. 2012. Reduction in cane Juice quality due to red rot infection. *Indian Sugar*. May: 27-30.
- Pandey, S. S., Kamat, D. N. and Singh, P. K. 2007. Varietal status of sugarcane in Bihar, All India Seminar on Development of Sugar Industry in Bihar and sugarcane planting method including intercropping and biological control of weed, pests and diseases, 24-25 March, 2007 at Patna PP: 73-77.
- Viswanathan, R. 2010. Plant disease: Red rot of sugarcane. *New Delhi: Annual publications*:
- Viswanathan, R. and Rao, G. P. 2011. Disease scenario and management of major sugarcane disease in India. *Sugar Tech* 13: PP. 336-353.
- Viswanathan, R. 2012. Sugarcane diseases and their management. Sugarcane Breeding Institute Coimbatore: ICAR -140.