Chapter 7  
DISCUSSION

“Before you start some work, always ask yourself three questions – Why I am doing it, What the results might be and will I be successful. Only when you think deeply and find satisfactory answers to these questions, go ahead.”  

- Chanakya

The experimental findings presented in the preceding chapter are interpreted here in light of scientific reasoning in order to establish cause and effect relationship as far as possible. The investigation was carried out to study comparative effect of different organic manures and fertilizers on growth, quality and yield of sugarcane plant and ratoon crop with sugarcane variety co-86032 and co-94012.

7.1 Germination and clump population

Germination percentage of sugarcane plant crop recorded at 45 days after planting did not vary significantly due to various integrated manures and fertilizers treatments. However, crop fertilized with nitrogen through 50% press mud and 50% urea (T7) exhibited maximum germination 55.6% and 57.4% in sugarcane variety CO86032 and CO94012 respectively. In ratoon crop maximum clump formation was recorded in same treatment with 57.5 thousand ha\(^{-1}\) and 54.5 thousand ha\(^{-1}\) sugarcane variety CO86032 and CO94012 respectively (Table No. 6.1 and 6.20).

This increase in germination percentage and clump population which might be due to increase in availability of nutrients in integrated form organic manure might have improved soil temperature, air exchange capacity and reduced bulk density which are congenial for good germination. Similar results were also found, Dey P.C. (1996), Sonawane D.A. (1997), Saini S.K. and et al (2006), Singh Ajay K and et al (2009).

7.2 Number of tillers and shoot population

The differences in number of tillers and shoot population due to integrated nutrient sources were significant in both plant and ratoon crop. In both season when nitrogen was supplied through 50% press mud and 50%
urea T7 showed maximum increase in number of tillers and shoot population respectively. In Plant cane number of tillers was recorded 154.2 thousand ha\(^{-1}\) and 151.2 thousand ha\(^{-1}\). Where as in ratoon cane it was 160.3 thousand ha\(^{-1}\) and 155.2 thousand ha\(^{-1}\) respectively in sugarcane variety CO86032 & CO94012. In both season second best treatment was found to be the application of nitrogen 50 % through vermicompost and 50 % urea (T3). Which was followed by 50 % Neem cake + 50 % Urea (T5) (Table No. 6.1 and 6.20).

The higher increase in number of tillers and shoot population under above treatment in Plant and ratoon crop may be attributed to higher initial germination. More tillering under this treatment may be attributed to prolonged release of nutrients as a result of mineralization of press mud and vermicompost apart from inorganic fertilizer. These results were conformity with the finding of Singh G. and et al (1991), Singh O.P. (1995), Manoharan M. Land et al (1992), Sonawane D.A. (1997), Bokhtiar S.M. et al (2001), Singh Ajay K and et al (2009).

7.3 Total and Millable cane height

In Plant crop maximum increase in total height of plant was recorded 325 c.m. and 320 c.m. Whereas maximum increase in millable cane height was found 224 cm and 220 cm with sugarcane variety CO86032 and CO94012 respectively. Where nitrogen was supplied through 50 % Press mud and 50 % Urea (T7).

In ratoon crop maximum increase in total height of plant was recorded 310 c.m. and 305 c.m. Whereas maximum increase in millable cane height was found 212 cm and 210 cm with sugarcane variety CO86032 and CO94012 respectively. Where nitrogen was supplied through 50 % Press mud and 50 % Urea (T7) (Table No. 6.2 and 6.21).

This increase in total and millable cane height of sugarcane might be due to better supply of nutrients through integrated manures during cell elongation phase. In this phase internodelmeristmatic tissues were involved for cell elongation and that ultimatly affect the incrase in total and millable cane height. Which indirectly effect to increasing total and millable cane height. These results were similar to the finding of Singh G. et.al. (1991), Singh O.P. (1995), Dinesh kumar M. et.al.(1996), Sonawane D.A. (1997),

7.4 Number of internodes

In plant crop maximum increase in number of internodes was 27 and 24 with sugarcane variety CO86032 and CO94012 respectively. Whereas during ratoon it was recorded 26 and 24 with sugarcane variety CO86032 and CO94012 respectively. During both season maximum increase in number of internodes was found in treatment where nitrogen was supplied through 50 % press mud and 50 % Urea (T7) (Table No. 6.3 and 6.22).

This increase in number of internodes might be due to more availability of nutrients by integrated method leading favourable effect on cell enlargement and cell elongation and which results increase in length. These results are in conformity with the findings of Nassir Ahmed (1987), Sonawane D.A. 1997, Vijaykumar and K.S. Verma (2002), Kanjana D. and James G. (2007), Singh Ajay K et.al. (2009).

7.5 Length and Girth of Internodes

In Plant crop maximum increase in length of internodes was recorded 18.5 c.m. and 18.0 c.m. in sugarcane variety CO86032 and CO94012 respectively whereas as in ratoon crop maximum length of internodes was found 15.7 c.m. and 15.0 c.m. respectively. During both season maximum increase in length of internodes was found in treatment where nitrogen was supplied through 50 % press mud and 50 % urea (T7). (Table No. 6.3 and 6.16)

This increase in length of internodes might be due to more availability of nutrients by integrated method leading favourable effect on cell enlargement and cell elongation and which results increase in length. These results are in conformity with the findings of Sonawane D.A. (1997), Kanjana D. and James (2009), Vijay Kumar and Verma K.S. (2002).

The girth of internodes was significantly influence by different treatments. In Plant crop maximum increase in girth of internodes was recorded 12.5 cm and 12.4 cm in sugarcane variety CO86032 and CO94012 respectively. Whereas during ratoon it was recorded 11.0 and 11.3 with sugarcane variety CO86032 and CO94012 respectively. During both season maximum increase in girth of internodes was found in treatment where
nitrogen was supplied through 50 % press mud and 50 % urea (T7) (Table No. 6.3 and 6.22).

This increase in girth of inter nodes might be due to increase in number of leaves and there by the total leaf area per plant. The leaf area was directly proportional to maximizing the rate of photosynthesis. Which was finally helpful for maximum increase in girth of internodes. These results were in conformity to the finding of Dey P. and et al (1996), Singh G. and et.al. (1991), Dineshkumar M. and et al (1996). Rao S. and Veeranna V.S. (1998), Vijaykumar and et al (2002), Paul G.C. (2005), Saini S.K. (2006), Singh Dilip and Dashora L.N. (2009), Kanjan and G.James (2009).

7.6 Juice Quality

7.6.1. Brix Percentage

In Plant cane maximum brix percentage was recorded 25.49 & 28.08 with sugarcane variety CO86032 and CO94012 respectively. Where nitrogen was supplied through 50 % press mud & 50 % urea. In Ratoon cane maximum brix was recorded 25.2 in sugarcane variety CO86032 where nitrogen was supplied 50 % vermicompost + 50 % urea (T3). Where as in variety CO94012 maximum brix was recorded 27.39 where nitrogen was supplied 50 % Neemcake and 50 % urea. This treatment was found to be significantly superior over all the treatments. The second best treatment was recorded with over all application of nitrogen through 50 % vermicompost and 50 % urea. This increase in brix percentage might be due to integrated nutrients through manures and fertilizer. The total solid substance present in juice were accumulated in cane. These results were in conformity with the finding of Dineshkumar M. et.al. (1996), Sonawne D.A. (2000), Tyagi Shashank (2005, Paul G.C. et.al. (2005) Saini S.K. et.al. (2006), Venkatakrishanan D. et.al. (2007).

7.6.2 Sucrose percentage

In Plant crop maximum increase sucrose percentage was 20.27 and 23.90 with sugarcane variety CO86032 and CO94012 respectively where nitrogen was supplied through 50 % Press mud and 50 % urea. Whereas in ratoon crop sucrose percentage was 20.14 and 22.79 with sugarcane variety CO86032 and CO94012 respectively. Where nitrogen was supplied 25 % Neem cake and 75 % Urea (T6). This increase in sucrose percentage might be
due to supply of nitrogen through integrated method. There was co-relation
between nitrogen supply in juice sucrose due to increase in proteinous

This results are in conformity with the finding of Dey P.C. et.al.
7.6.3 Purity Percentage

In sugarcane production purity of juice was one of important factor. Purity percentage is the ratio of sucrose and brix in percent from. In plant crop maximum increase in purity percentage was recorded 79.55 and 85.11 percent with sugarcane variety CO86032 &CO94012 respectively. Where nitrogen was supplied through 50 % Press mud + 50 % Urea (T₇). During ratoon crop in case of sugarcane variety CO86032 maximum increase in purity percentage was recorded 81.52 percent where nitrogen was supplied through 50 % cassia leaves + 50 % urea (T₉). For sugarcane variety CO94012 maximum purity percentage was found 84.64 percentages where nitrogen was supplied through 50 % press mud + 50 % urea (T₇).This increase in purity percentage might be due to increase in sucrose and brix percentage with the application of various manures and fertilizers in integrated form. The excess nitrogen prolongs vegetative growth, delays maturity or ripening and effect on juice purity ( Jeyaraman et al 2003). This effect on increae or decrease in purity may due to content of monosaccharides in juice ( Patil and Shingate 1982 and Kapoor et al 1993).

These results are confirmatory with the finding of Sonawane D.A.

7.6.4 Commercial cane Sugar Percent and C.C.S. Mt/ha

In plant crop maximum increase in C.C.S. Percentage was found 13.51
% with sugarcane variety CO 86032 where nitrogen was supplied 25 %
through Neemcake + 75 % urea (T₆). Whereas in CO 94012 highest C.C.S.
percentage was recorded 15.56 % where nitrogen was supplied through 50 %
pressmud + 50 % urea (T₇). Ratoon crop in CO 86032 maximum C.C.S.
percentage was 13.51 % where nitrogen was supplied through 25 % neemcake
+ 75 % urea ($T_6$). In CO 94012 it was found 15.56 % where nitrogen was supplied 50 % pressmud + 50 % urea ($T_7$) (Table No. 6.6 and 6.26).

In plant crop maximum increase in C.C.S. $M\text{Tha}^{-1}$ was found 13.11 $M\text{Tha}^{-1}$ with sugarcane variety CO 86032. Where nitrogen was supplied through 50 % vermicompost + 50 % urea ($T_3$). Whereas in CO 94012 highest C.C.S. $M\text{Tha}^{-1}$ was recorded 22.75 $M\text{Tha}^{-1}$ where nitrogen was supplied through 50 % pressmud + 50 % urea ($T_7$). Ratoon crop in CO 86032 maximum C.C.S. was 13.11 $M\text{Tha}^{-1}$ where nitrogen was supplied through 50 % vermicompost + 50 % urea ($T_3$) where as in CO 94012 highest C.C.S. was recorded 14.30 $M\text{Tha}^{-1}$ where nitrogen was supplied 50 % pressmud + 50 % urea ($T_7$) (Table No. 6.6 and 6.25).

Commercial cane sugar is a product of cane yield and available sugar percent in cane. The variations in commercial cane sugar in plant and ratoon crops due to different treatments were significant. Such variations were largely attributed to variations in cane yield. The increase cane yield due to and integrated nutrient management and which enhanced commercial cane sugar.


### 7.7 Cane Yield

The integrated nutrient supply had significant effect on total yield of plant and ratoon canes. The total yield which is the summation of cane yield and green top. The maximum increase in total yield for Plant crop was recorded 167.4tha-1 and 170.8 tha-1 respectively for sugarcane variety CO86032 and CO94012. Where as in ratoon cane maximum total yield was 125.9 tha-1 and 121.5tha-1 respectively. In both season maximum total yield was observed in treatments where nitrogen was supplied through 50 % Press mud and 50 % Urea ($T_7$). The maximum increase in green top for Plant crop was recorded 26.0 tha-1 and 32.5 tha-1 in sugarcane variety CO 86032 and CO94012 respectively. Where as in ratoon crop it was recorded 25.4 and 26.4 respectively.In both season maximum green top was observed in
treatment where nitrogen was supplied through 50 % press mud and 50 % Urea (T_7).

The maximum increase in cane yield for plant crop was recorded 141.4 tha\(^{-1}\) and 138.3 tha\(^{-1}\) respectively for sugarcane variety CO86032 and CO94012. Where in ratoon crop maximum cane yield was 100.5 tha\(^{-1}\) and 95.1 tha\(^{-1}\) respectively. In both season maximum cane yield was observed in treatment where nitrogen was supplied through 50 % press mud and 50 % urea (T_7) (Table No. 6.4 and 6.23).

The integrated application of pressmud and urea significantly influenced on the growth and yield contributing characters and helped in improving physical, chemical and biological properties of soil in addition to the increment in yield. It might have helped in making available nutrients throughout the growth as per requirements besides improvement in soil fertility.


7.8 Dry Matter kg/ha

All the treatments consist of organic manures through various sources in combinations with fertilizer showed significantly more dry matter in leaves and stem consequently produced more total dry matter.

In plant crop the total dry matter kg/ha in cane was recorded 53459.13 and 52998.06 kg/ha and in green top it was 12661.65 and 16867.49 kg/ha\(^{-1}\) together the total dry matter was found 66120.82 and 69865.55 kg/ha\(^{-1}\) in sugarcane variety CO86032 and CO 94012 respectively. Where nitrogen was supplied through 50 % Press mud + 50 % Urea (T_7).

For ratoon crop the total dry matter kg/ha in cane was recorded 45738.41 and 44422.30 kg/ha and in green top it was found 13359.21 and 14765.89 kg/ha together the total dry matter was found 59097.62 and
59188.19 kgha\(^{-1}\) in sugarcane variety CO86032 and CO94012 respectively where nitrogen was supplied through 50 % press mud + 50 % urea (T\(_7\)) (Table No. 6.7 and 6.26).

The increase in terms of plant height, leaf number, leaf size were found to use full increasing photosynthetic activities and there by accumulation of more carbohydrates and consequently higher dry matter accumulation. These results are in agreement with the finding of Sonawane D.A. (1997) and Tyagi Shashank (2005)

### 7.9 Nutrient Content

Nitrogen phosphorus and potassium kgha\(^{-1}\) in cane, leaves and total plant of sugarcane recorded at different season in plant and ratoon crop varied significant under different treatments. In plant crop at harvesting stage in case of sugarcane variety CO86032 maximum nitrogen, phosphorous and potassium kg/ha in total plant was 386.27, 108.46, and 325.19 kgha\(^{-1}\) respectively. Whereas in CO94012 it was found 348.21, 110.00 and 313.81 kgha\(^{-1}\) respectively. Where nitrogen was supplied 50 % pressmud + 50 % urea (T\(_7\)). In ratoon crop at harvesting stage in case of sugarcane variety CO 86032 maximum nitrogen, phosphorous and potassium kg/ha in to total plant was 369.72, 99.56 and 300.49 kgha\(^{-1}\) respectively. Whereas in CO 94012 it was found 352.47, 91.46 and 299.55 kgha\(^{-1}\) respectively. Where nitrogen was supplied 50 % pressmud + 50 % urea (T\(_7\)).

The increase in nitrogen, phosphorus, and potassium content by sugarcane might have been the cumulative effect of higher dry matter production with higher amount of nitrogen, phosphorus and potassium in component parts viz cane and green top.

Higher nutrient concentration in different plant parts under above treatment might be due to increased nutrients concentration in soil solution owing to better soil condition for plant growth. Nitrogen, phosphorus and potassium content in both cane and leaves tended to decline with advancement in crop age may be due to dilution effect as result of higher dry matter accumulation. These results are confirmative with the finding of Singh K.D. (1989), Kadam et.al. (1991), Sonawane D.A. (2000), Bokhatiar (2001), Vijaykumar (2002), Tyagi Shashank (2005), Bhalerao V.P. (2006), Jagtap S.M.
7.10 Nutrient Uptake

Nutrient uptake at harvest of plant and ratoon crop differed significantly under different treatments. During planting season when crop receiving nitrogen through 50% press mud and 50% urea exhibited maximum total nutrient (N+P+K) uptake of 386.23, 108.52, 325.26 kg ha\(^{-1}\) respectively in sugarcane variety CO86032 and 348.24, 109.96, 313.80 kg ha\(^{-1}\) respectively in sugarcane variety CO94012. Whereas crop without manures and fertilizers i.e. control treatment (T\(_{13}\)) exhibited lowest total nitrogen, phosphorous and Potassium uptake of 221.51, 44.39 and 174.89 kg ha\(^{-1}\) respectively in sugarcane variety CO86032 and 182.85, 59.27 and 171.38 MTha\(^{-1}\) respectively in sugarcane variety CO94012.

During ratoon season when crop receiving nitrogen through 50% press mud and 50% urea exhibited maximum total nutrient (N+P+K) uptake of 369.54, 99.67 and 300.39 kg ha\(^{-1}\) respectively in sugarcane variety CO86032 and 352.38, 91.61, 299.57 kg ha\(^{-1}\) respectively in sugarcane variety CO94012. Where as crop without manures and fertilizers i.e. control treatment (t13) exhibited lowest total nitrogen, phosphorous and Potassium uptake of 273.02, 65.21 and 220.78 kg ha\(^{-1}\) respectively in sugarcane variety CO86032 and 264.69, 62.66 and 219.09 MTha\(^{-1}\) respectively in sugarcane variety CO94012.

The variations in nutrient uptake may be attributed to variation in nutrient concentration in the index tissue, apart from the dry matter accumulation. The increase in nitrogen, phosphorous and potassium uptake by sugarcane might have been the cumulative effect of higher dry matter production with higher amount of nitrogen, phosphorus and potassium in component parts viz cane, greentops. These results are confirming with the finding of Singh K. D. et al (1989), Kadam et. al. (1991), Sonawane D.A. (1997), Tyagi Shashank (2005), Kamathe N.D. (2007).

7.11 Economics

7.11.1 Cost of cultivation

In plant and ratoon crop sugar cane variety Co 86032 and Co 94012 showed same cost of cultivation. However it is varies according treatment and season. In plant crop effect on maximum cost of cultivation was found in
treatment of 50 % NC + 50 % U (T₅) i.e. Rs/ha 146955 and 146955 Rs/ha in sugarcane variety CO86032 and CO94012 respectively, whereas in ratoon maximum cost of cultivation was recorded in same treatment i.e. 105329 and 105329 Rs/ha in sugarcane variety CO86032 and CO94012 respectively.

7.11.2 Gross return

In plant crop maximum gross return was found Rs. 282800/ha and Rs. 276600/ha in sugarcane variety CO 86032 and CO 94012 respectively. Where nitrogen was supplied 50 % PM + 50 % U (T₇)

In ratoon crop maximum gross return was recorded Rs. 226162/ha and Rs. 214020/ha in sugarcane variety CO 86012 and CO 94012 respectively where nitrogen was supplied through 50 % PM + 50 % U (T₇).

7.11.3 Net return

In plant crop maximum net return was found Rs. 225836/ha and Rs. 219636/ha in sugarcane variety CO 86032 and CO 94012 respectively where nitrogen was supplied through 50 % PM + 50 % U (T₇). In ratoon crop in case of sugarcane variety CO 86032 maximum net return was found Rs. 187030/ha where nitrogen was supplied 50 % PM + 50 % Urea (T₇). In case of sugarcane variety CO 94012 maximum net return was recorded Rs. 174888/ha where nitrogen was supplied 25 % NC + 75 % Urea (T₆)

7.11.4 Benefit Cost ratio

In plant crop maximum benefit cost ratio was found 3.96 and 3.85 in sugarcane variety CO 86032 and CO 94012 respectively where nitrogen was supplied 50 % PM + 50 % U (T₇). In ratoon crop maximum benefit cost ratio was found 8.07 and 7.03 in sugarcane variety Co 86032 and Co 94012 respectively in control treatment (T₁₃) which was followed by 4.17 and 4.16 cost benefit ratio with sugarcane variety Co 86032 and Co 94012 respectively where nitrogen was supplied 50 % PM + 50 % U (T₇)