

Short Communications

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Trends of Area, Production and Productivity of Rapeseed and Mustard in Different Districts of Chhattisgarh, India

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ABSTRACT

The regression analysis indicates that the area under rapeseed-mustard is positively and significantly increasing in Raipur ($R = 0.70^{**}$), Durg ($R = 0.65^{**}$), Rajnandgaon ($R = 0.71^{**}$) and Surguja ($R = 0.49^{*}$) districts because it is an irrigated crop, so increase irrigation facilities in these districts, have led to increase in cultivation of rapeseed-mustard. However, the increasing trend in rapeseed-mustard area in Bastar, Raigarh districts is not significant. The area of rapeseed-mustard is sharply decreasing in Bilaspur (1253 ha/year), which poses serious threat for the production of rapeseed-mustard in Bilaspur district. The area in Raigarh under rapeseed-mustard cultivation showed no change during study period except in last two years in which, area has increased many fold. The production under rapeseed-mustard showed positive and significant increase in Raipur ($R = 0.71^{**}$), Durg ($R = 0.63^{**}$) Rajnandgaon ($R = 0.73^{**}$), Raigarh ($R = 0.56^{**}$) and Surguja ($R = 0.71^{**}$) districts, however the increase of production in Bastar district is non-significant ($R = 0.26$). The increasing trend in production can be attributed to increased area and productivity of rapeseed-mustard in these districts. The production in Bilaspur ($R = 0.64^{**}$) district is decreasing due to declining area of cultivation under rapeseed-mustard. The productivity of rapeseed-mustard showed increasing trend over the study period in the entire state due to technology impact, intensive cultivation by progressive farmer, integrated pest disease management and use of high yielding varieties. Whereas, the impact these practices is not much sound in Raipur district ($R = 0.14$).

Keywords

Weather parameters, *rabi*, Rapeseed-mustard

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Introduction

Weather parameters play major role in determining the crop growth, development and yield because weather strongly influences the physical expression of genetic potential of the crop. The yield from any given crop or variety depends on the extent to which certain optimum weather conditions like solar radiation, temperature, humidity, rainfall, evaporation and wind speed varies from its

optimum conditions. Any significant deviation of these parameters from the optimum value became detrimental for the crop productivity. India occupies third position in area and production of rapeseed-mustard in world. It is the major *rabi* oilseed crop in Chhattisgarh under irrigated condition in rice based cropping system. It occupies largest area of 140.5 thousands ha production of 62.0 thousand tones and productivity of 441 kg ha⁻¹, respectively (Hegde, 2005).

Materials and Methods

The present study is carried out in the state Chhattisgarh, which came in to existence on 1st Nov. 2000 as a result of bifurcation of M.P. state. It lies in eastern part of India and located between 17^o 41' N and 24^o 45' N latitude and 79^o 30' E and 84^o 15' E longitude.

Orrisa surrounds it in the east in the west by M.P. and Maharashtra, in the north by U.P. and Jarkhand and in the south by Andhra Pradesh.

The long term crop data in regard to area, production and productivity for groundnut sesames, linseed, rapeseed-mustard, soybean and total oilseeds that are grown during *kharif* and *rabi* seasons of different districts of Chhattisgarh were collected from the published records of department of Agriculture, Government of Madhya Pradesh, Bhopal and Government of Chhattisgarh, Raipur. Data were obtained for the period 1974-75 to 2003-04 and were used in present study.

Trend analysis

For temporal analysis of area, production and productivity of oilseeds crop in undivided districts of Chhattisgarh the time trend equations were constructed as:

$$Y = a + b X$$

Where,

Y = area, production, productivity

X = year

a = intercept

b = slope

The slope indicates the trend of area, production and productivity over the study period.

Results and Discussion

Area

In Raipur, the time trend pattern of area of rapeseed-mustard shows slow increase of area until the end of the 20th century, while it is increasing sharply in present century as indicated in Figure 1. The highest area was observed in the year 2002-03 (11.0 thousand ha), whereas, lowest area was observed in the year 1980-81 (0.2 thousand ha). The regression equation is $Y = 0.2231 X - 1.5979$ and R value is 0.70, which is highly significant at 1 % probability level.

In Durg district, the area under rapeseed-mustard has stagnated in the different year as shown in Figure 1. The highest area was observed in the year 2003-04 (6.0 thousand ha), whereas, lowest area was observed in the year 1974-75 (0.01 thousand ha). The time trend equation is $Y = 0.1109 X - 0.942$ and R value is 0.65, which is significant at 1 % probability level.

In Rajnandgaon district, area under rapeseed-mustard in different years is increasing at a rate of 488 ha/year as shown in Figure 1. The highest area was found in the year 2003-04 (8.6 thousand ha) and the lowest area was found in the year 1976-77 (0.4 thousand ha). The regression equation is $Y = 0.1488 X + 0.4634$ and R value is 0.71, which is statistically highly significant at 1 % probability level.

In Bastar district, the area under rapeseed-mustard has stagnated in the different years as shown in Figure 1. The highest area under rapeseed-mustard cultivation was found in the year 2003-04 (35.0 thousand ha). Whereas, lowest area was found in the year 1999-2000 (9.3 thousand ha). The regression equation is $Y = -0.0439 X + 16.633$ and R value is 0.08, which is non-significant.

In Bilaspur district, the area under rapeseed-mustard is gradually decreased at the rate of 1253 ha/year as shown in Figure 1. The highest area under rapeseed-mustard cultivation was found in the year 1974-75 (42.4 thousand ha), whereas, lowest area was found in the year 1994-95 (4.1 thousand ha). The regression equation is $Y = -1.2532 X + 35.874$ and R value is 0.78, which is statistically highly significant at 1 % probability level.

In Raigarh, the trend of area of rapeseed-mustard shows stagnation during the study period as shown in Figure 1. The highest (20.0 thousand ha) and lowest (4.9 thousand ha) was observed in the year 2003-04 and 1976-77. The time trend equation is $Y = 0.0849 X + 5.3768$ and R value is 0.23, which is non-significant.

In Surguja district, the area under rapeseed-mustard has increased during study period at the rate of 345ha/year as shown in Figure 1. The highest area was found in the year 2003-04 (45 thousand ha) and the lowest area was found in the year 1976-77 (10.8 thousand ha). The time trend regression equation is $Y = 0.3448 X + 21.309$ and R value is 0.49, which is non-significant at 5 % probability level.

The regression analysis indicates that the area under rapeseed-mustard is positively and significantly increasing in Raipur (R = 0.70**), Durg (R = 0.65**), Rajnandgaon (R = 0.71**) and Surguja(R = 49*) districts because it is an irrigated crop, so increase irrigation facilities in these districts, have led to increase in cultivation of rapeseed-mustard. However, the increasing trend in rapeseed-mustard area in Bastar, Raigarh districts is not significant. The area of rapeseed-mustard is sharply decreasing in Bilaspur (1253 ha/year), which poses serious threat for the production of rapeseed-mustard in Bilaspur district. The area in Raigarh under rapeseed-mustard cultivation showed no change during study

period except in last two years in which, area has increased many fold.

Production

In Raipur district, the production pattern of rapeseed-mustard shows increasing trend as shown in Figure 2. The yields were stagnated during the early phase of study period but are sharply increase in the later stage. The highest production was found in the year 2002-03 (5.7 thousand tonnes) and the lowest yield was found in the year 1979-80 (0.4 thousand tonnes). The time trend equation was $Y = 0.1129 X - 0.7906$ and R value is 0.71, which is highly significant at 1 % probability level. Similarly, in Durg district the production of rapeseed-mustard shows stagnation in early phase and sharp increase in later phases as shown in Figure 2. The highest production was observed in the year 2002-03 (3.5 thousand tonnes) and lowest production was found in 1974-75 (0.004 thousand tonnes). The regression equation is $Y = 0.0677 X - 0.6049$ and R value is 0.63, which is significant at 1 % probability level.

As for as production pattern of rapeseed-mustard was concerned, Rajnandgaon district it showed increasing trend as shown in Figure 2. The highest production was found in the year 2001-02 (5.4 thousand tonnes) and the lowest yield was found in the year 1976-77 (0.04 thousand tonnes). The time trend regression equation is $Y = 0.0921 X - 0.0129$ and R value is 0.73, which is statistically highly significant at 1 % probability level. In Bastar district, the production of rapeseed-mustard has considerably fluctuated in the different years as shown in Figure 2. The highest production of 17.7 thousand tonnes and the lowest production of 2.3 thousand tonnes found in the years 2001-02 and 1976-77, respectively. The regression equation is $Y = 0.084 X + 6.5853$ and R value is 0.26, which is non-significant.

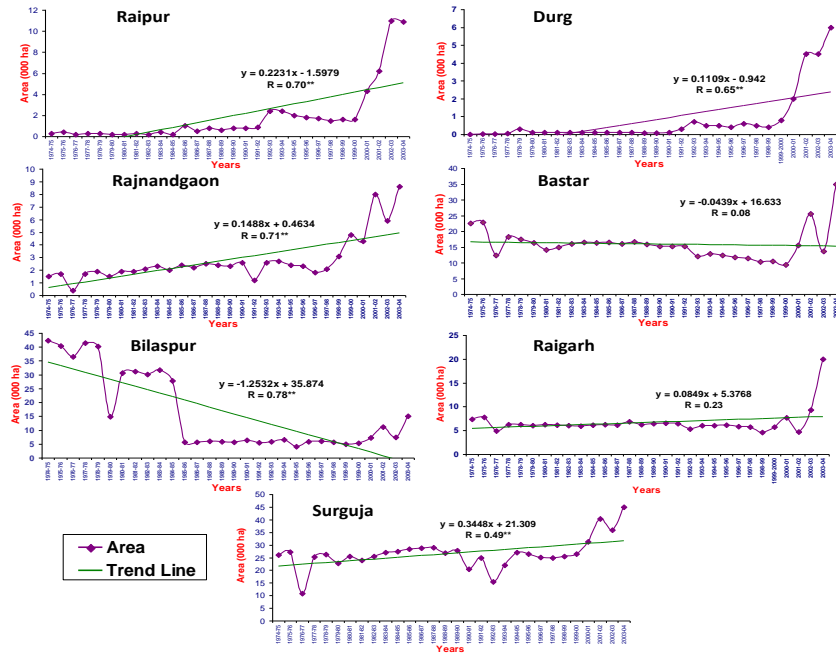


Fig. 1.1 : Trends of area of rapeseed and mustard in different districts of Chhattisgarh

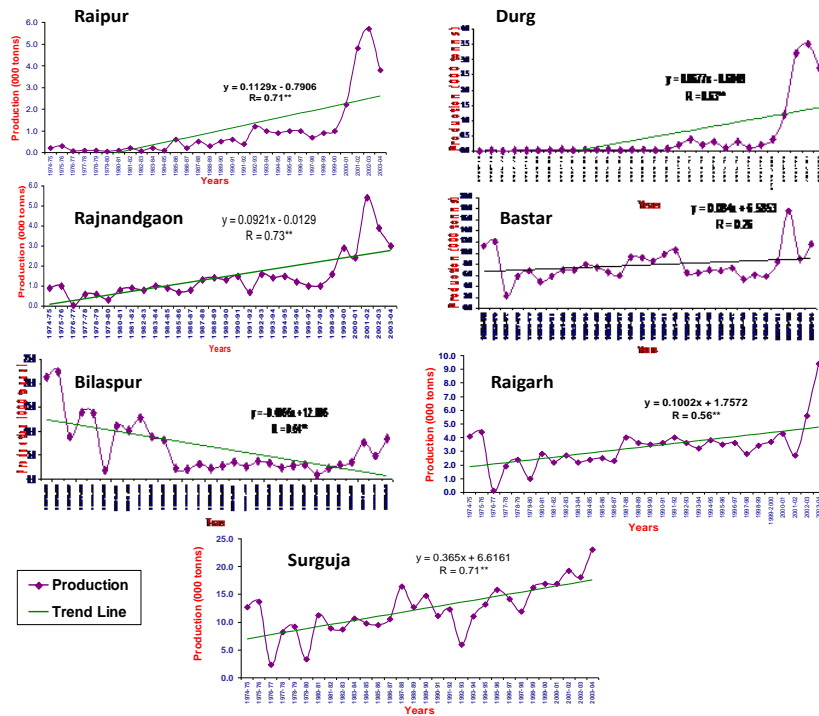


Fig. 1.2: Trends of production of rapeseed and mustard in different districts of Chhattisgarh

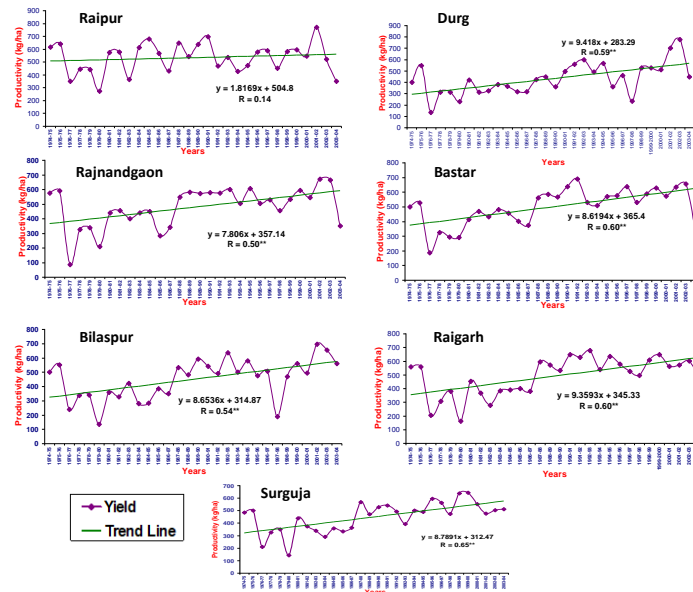


Fig. 1.3 : Trends of productivity of rapeseed and mustard in different districts of Chhattisgarh

The study was carried out in 7 undivided districts of Chhattisgarh regions, which are:

S. No	Station	Latitude	Longitude
1	Raipur	21°14' N	81°39' E
2	Durg	21° 13' N	81° 17' E
3	Rajnandgaon	21° 05' N	81° 02' E
4	Bastar	19° 05' N	82° 02' E
5	Bilaspur	22° 05' N	82° 08' E
6	Raigarh	21° 55' N	83° 24' E
7	Surguja	23° 07' N	83° 12' E

In Bilaspur district the production of rapeseed-mustard has decreased at the rate of 406 kg/year as shown in Figure 2. The highest production was observed in the year 1975-76 (22.3 thousand tonnes) and lowest production was observed in the year 1997-98 (1.0 thousand tonnes). The time trend equation is $Y = 0.4066 X + 12.886$ and R value is 0.64, which is significant at 1% probability level.

In Raigarh district, the rapeseed-mustard production has increased sharply in the present century, while, it showed stagnation in the last century as shown in Figure 2. The

time trend equation is $Y = 0.1002 X + 1.7572$ and R value is 0.56, which is significant at 1% probability level.

The production of rapeseed-mustard is continuously increasing in Surguja district as shown in Figure 2. The highest production was found in the year 2003-04 (23.0 thousand tonnes) and the lowest production in the year 1976-77 (2.3 thousand tonnes). The regression equation is $Y = 0.365 X + 6.6161$ and R value is 0.71, which is statistically highly significant at 1% probability level. The production under rapeseed-mustard showed

positive and significant increase in Raipur ($R = 0.71^{**}$), Durg ($R = 0.63^{**}$) Rajnandgaon ($R = 0.73^{**}$), Raigarh ($R = 0.56^{**}$) and Surguja ($R = 0.71^{**}$) districts, however the increase of production in Bastar district is non-significant ($R = 0.26$).

The increasing trend in production can be attributed to increased area and productivity of rapeseed-mustard in these districts. The production in Bilaspur ($R = 0.64^{**}$) district is decreasing due to declining area of cultivation under rapeseed-mustard.

Productivity

In Raipur district, the productivity of rapeseed-mustard is fluctuating as shown in Figure 3. The highest productivity was observed in the year 2001-02 (769 kg ha^{-1}) and the lowest yield was observed in the year 1979-80 (273 kg ha^{-1}). Regression equation is $Y = 1.8169 X + 504.8$ and R value is 0.14, which is non-significant.

As far as productivity of rapeseed-mustard in Durg district is concerned, it showed increasing trend with fluctuations in some years as shown in Figure 3. The highest productivity was found in the year 2002-03 (777 kg ha^{-1}) and the lowest yield was found in the year 1976-77 (135 kg ha^{-1}). The time trend regression equation is $Y = 9.418 X + 283.29$ and R value is 0.59, which is significant at 1 % probability level.

In Rajnandgaon district, the productivity of rapeseed-mustard showed an overall increasing trend ($7.8 \text{ kg ha}^{-1} \text{ year}^{-1}$), though it has large interannual variation as shown in Figure 3. The highest productivity of 670 kg ha^{-1} and the lowest productivity of 87 kg ha^{-1} were observed in the years 2001-02 and 1976-77, respectively. The regression equation is $Y = 7.806 X + 357.14$ and R value is 0.50, which is significant at 1 % probability level.

The productivity of rapeseed-mustard shows increasing trend (8.6 kg per year) in Bastar as shown in Figure 3. The highest productivity was observed in the year 1991-92 (690 kg ha^{-1}) and lowest productivity was found in the year 1976-77 (188 kg ha^{-1}). The regression equation is $Y = 8.6194 X + 365.4$ and R value is 0.60, which is statistically significant at 1 % probability level.

In Bilaspur, the productivity of rapeseed-mustard in the different years is fluctuating with an overall increasing trend of 8.7 kg ha^{-1} per year as shown in Figure 3. The highest productivity was 696 kg ha^{-1} and the lowest productivity was 134 kg ha^{-1} observed in the years 2001-02 and 1979-80, respectively. The time trend regression equation is $Y = 8.6536 X + 314.87$ and R value is 0.54, which is significant at 1 % probability level.

Similarly, in Raigarh district the productivity fluctuated as shown in Figure 3. The highest productivity was found in the year 1992-93 (677 kg ha^{-1}), whereas, lowest productivity was found in the year 1979-80 (162 kg ha^{-1}), respectively. The regression equation is $Y = 9.3593 X + 345.33$ and R value was 0.60, which is significant at 1 % probability level.

In Surguja district, the productivity of rapeseed-mustard has over all increasing trend ($88 \text{ kg ha}^{-1} \text{ /year}^{-1}$) with large year-to-year deviations as shown in Figure 3. The highest productivity was found in the year 1999-2000 (643 kg ha^{-1}), whereas, lowest productivity was found in the year 1979-80 (144 kg ha^{-1}). The regression equation is $Y = 8.7891 X + 312.47$ and R value is 0.65, which is significant at 1 % probability level.

The productivity of rapeseed-mustard showed increasing trend over the study period in the entire district. The productivity increased significantly in Durg ($R = 0.59^{**}$), Rajnandgaon ($R = 0.50^{**}$), Bastar ($R =$

0.60**), Bilaspur (R=0.54**), Surguja (R = 0.65**) and Raigarh (R = 0.60**) districts due to technology impact, intensive cultivation by progressive farmer, integrated pest disease management and use of high yielding varieties. Whereas, the impact these practices is not much sound in Raipur district (R = 0.14).

Sodhiya (1990) estimated the linear trend in area, production and productivity of 10 major crops in Sagar division, Madhya Pradesh, for the period 1956-57 to 1982-83. He covered various crops such as wheat, rice, sorghum, millet, barley (in the cereal group), chickpea, lentil (pulse group) and linseed, sesamum, and soybean (in the oilseed crop). He found that crop such as sorghum and millet is decreasing, while, the production was

increasing of some inferior crop like sesamum.

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