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Impact of long term weather parameters on seed production of cauliflower

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Abstract

Sapruon valley of Solan District of Himachal Pradesh is an ideal area for seed production of cauliflower (*Brassica oleracea* var *botrytis* L). Weather parameters affect the seed yield and quality of cauliflower. A study was conducted to find out the relationship of long-term changes in weather parameters with seed productivity. The weather data on the basis of annual as well as monthly, maximum, minimum temperatures and humidity (forenoon and afternoon) was recorded for Sapruon valley of Solan district during 1991 to 2016. The data on cauliflower seed production from 1991 to 2016 for, along with data on weather parameters for the corresponding years were collected. The impact of climate variability on cauliflower seed production was worked out through correlation studies. The mean minimum and maximum temperatures of 6.6 °C and 18.2 °C respectively, during 1990-91 were increased to 11.6 °C and 22.1 °C, respectively, during 2015-16. The corresponding reductions in seed yield from 380.2kg/ha to 216.0 kg/ ha were observed. The reduction in cauliflower seed yield were attributed to fluctuating temperature and humidity conditions. Correlation with weather parameters was worked out. Maximum temperature exhibited significant negative correlation ($r=-0.472$) with seed yield which indicates that rise in maximum temperature, affects seed production adversely while forenoon humidity exhibited positive correlation ($r=0.411$) with cauliflower seed yield.

Keywords: Seed production, cauliflower, weather parameters, correlation

Introduction

Cauliflower (*Brassica oleracea* var. *botrytis* L.) is a biannual and herbaceous vegetable crop belonging to the family *Brassicaceae*. Cauliflower thrives best in a cool moist climate and it does not withstand very low temperature or too much heat (Din *et al.*, 2007) [2]. The temperature in the country remains higher up to mid-October after which gradually comes down in mid-December and extends up to mid-February, temperature increases sharply thereafter. Optimum weather parameters are important for crop growth and development. In some cases higher temperature during curd initiation adversely affect yield per unit area hampering vegetative and reproductive growth of plant specially head size and delay in seed maturity. Baloch (1994) [1] recommended that optimum temperature promotes earliness and larger heads. Seeds of cauliflower are produced in the country in a small scale but the maximum amount of seeds of cauliflower is imported from other countries. Cauliflower requires optimum temperature and humidity conditions for seed production. The optimum temperature for cauliflower withstands is 10 to 15 °C (Din *et al.*, 2007) [2]. Lavanya *et al.*, (2014) [5] recommended that optimum temperature is suitable treatment combination for higher seed yield. Gill and Singh (1973) [3] studied the effect of environmental factors on seed production of late Cauliflower in Kullu valley between 1958 and 1965 and noticed a great variation in the quantity of seed produced (0 to 291.25kg/ha). High mean maximum (16.43°C to 18.93°C) and minimum temperatures (4.67°C to 6.83°C) during October, November and December induced good vegetative growth. Fluctuation in temperature in February when curds are formed did great damage and reduced the seed yield by 49.17 to 100 per cent. So, climatically suitable location is needed for quality seed production of cauliflower. Keeping in view, the present study was conducted to find out the relationship of long-term changes in weather parameters with seed productivity. The weather data on the basis of annual as well as monthly, maximum, minimum temperatures and humidity (forenoon and afternoon) was recorded for Sapruon valley of Solan district during 1991 to 2016.

Objective

To study the impact of long term weather parameters on Seed Production of cauliflower.

Material and methods

Data on average monthly maximum, minimum temperature and rainfall collected from Berti Horticulture Research Station Saproon Valley, Solan for the year 1991 to 2017 and seed yield data of Cauliflower late variety Pusa snowall K- 1 was also collected from Saproon Valley. Correlation coefficient was calculated to find out relationship between seed yield and different weather parameters.

Statistical analysis: The data obtained were graphed using MS-Excel-2007 along with weather parameters and correlation coefficients were calculated by using OP-STAT Software.

Result and Discussion

The data on cauliflower seed production from 1991 to 2016 for Saproon valley of Solan district, along with data on weather parameters for the corresponding years were collected and impact of climate variability on cauliflower seed production was worked out through correlation studies. The data presented in Table 1 revealed that, with the increase in

minimum and maximum temperatures the cauliflower seed production decreased continuously in the area which was previously known as a potential site for quality seed production. The reduction in cauliflower seed yield were attributed to fluctuating temperature and humidity conditions. The mean minimum and maximum temperatures of 6.6 °C and 18.2 °C, respectively, during 1990-91 have been recorded to were increased to 11.6 °C and 22.1 °C, respectively, during 2015-16. The corresponding reductions in seed yield from 380.2 kg/ha to 216.0 kg/ ha were observed. When correlated with weather parameters the maximum temperature exhibited significant and negative correlation ($r = -0.472$) and forenoon humidity showed positive correlation ($r = 0.411$) with cauliflower seed yield.

Similar results were also reported by Kumar *et al.* (2009) [4] in cabbage in Kullu valley of Himachal Pradesh. The correlation of cabbage seed production with mean maximum temperature during April ($r = -0.36$) and May ($r = -0.39$) exhibited significant and negative effect, indicating that increase in temperature during these months affected seed production adversely.

Table 1: Seed yield of cauliflower and mean weather parameters during last 25 years in Solan district of Himachal Pradesh

Year	Temperature (°C)		Humidity (%)		Seed yield (kg/ha)
	Maximum	Minimum	Forenoon	Afternoon	
1990-91	18.2	6.6	72.1	43.1	380.2
1991-92	18.7	5.7	77.2	42.2	316.0
1992-93	19.7	2.3	64.1	52.2	300.1
1993-94	17.1	2.6	68.3	48.2	286.2
1994-95	19.6	5.7	59.2	46.3	210.1
1995-96	21.4	7.8	48.2	39.2	222.1
1996-97	17.4	10.9	51.2	38.2	310.2
1997-98	19.2	9.7	45.2	40.2	189.2
1998-99	19.7	8.6	57.2	43.2	220.1
1999-2000	19.0	9.2	54.2	38.1	150.2
2000-2001	19.2	10.2	65.2	43.1	310.1
2001-2002	19.8	10.9	62.6	42.1	105.2
2002-2003	20.1	8.2	65.3	41.1	209.1
2003-2004	20.2	8.3	62.1	40.1	190.1
2004-2005	20.4	8.9	64.1	41.8	189.1
2005-2006	20.0	7.2	76.8	32.1	170.4
2006-2007	20.1	6.6	79.1	39.1	179.1
2007-2008	20.2	11.4	63.9	41.1	210.1
2008-2009	20.1	11.6	70.1	42.1	140.2
2009-2010	21.1	12.3	68.4	44.5	231
2010-2011	21.5	11.5	64.2	44.0	220
2011-2012	21.0	11.9	60.4	50.3	148.0
2012-2013	21.7	10.1	68.3	38.1	166.0
2013-2014	21.2	11.1	70.1	54.6	198.2
2014-2015	21.9	7.9	69.4	53.2	222.1
2015-2016	22.1	11.6	72.7	52.3	216.0

Table 2: Correlation coefficient (r) of seed yield (kg/ha) of cauliflower during last 25 years with weather parameters in Solan district of Himachal Pradesh

Weather variables \ seed Yield (1990-2016)	Correlation coefficient (r)
Maximum Temperature	-0.472*
Minimum Temperature	0.383
Forenoon Humidity	0.411*
Afternoon Humidity	0.207

**Significant at 5% level

*Significant at 1% level

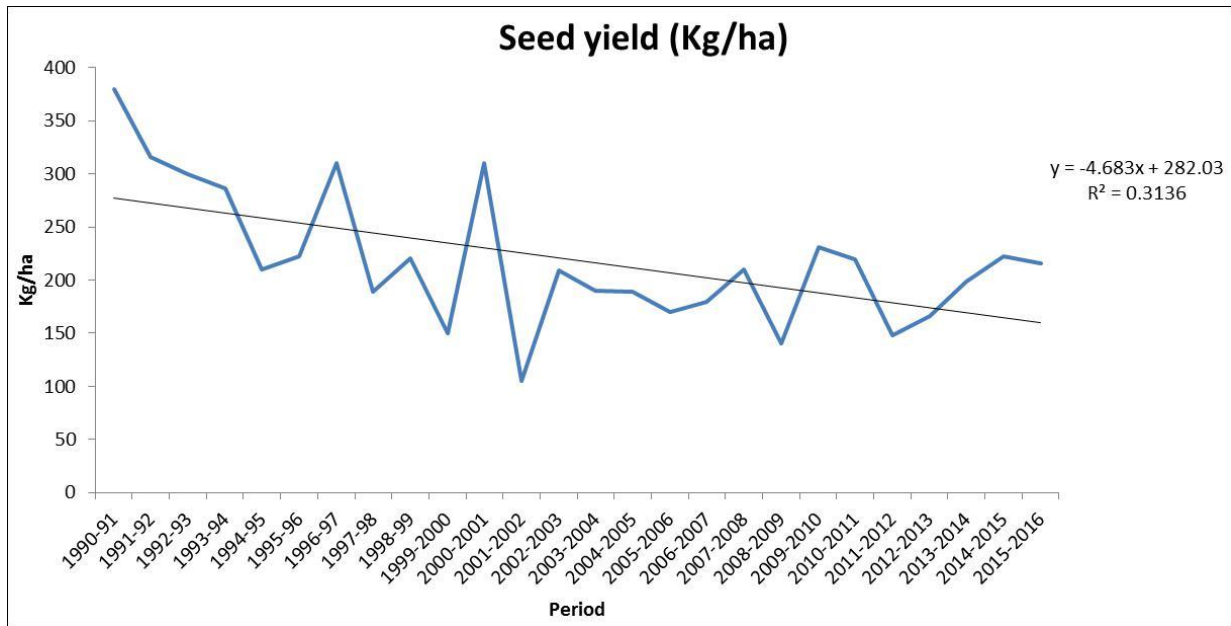


Fig 1: Decreasing trend of seed yield of Cauliflower in Saproon valley of Himachal Pradesh

Conclusion

Long term impact of weather parameters on seed production revealed negative impact of maximum temperature and positive impact of forenoon humidity on cauliflower seed production during the period under study. Long term impact of weather parameter on seed production revealed that, maximum temperature exhibited negative correlation and forenoon humidity showed positive correlation with cauliflower seed yield.

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