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Rainfall and Temperature Trends in Different Agro climatic zones of Punjab

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ABSTRACT

This study aims to observe trends in rainfall and temperature in different agroclimatic regions of Punjab. In central plain zone, increasing trend has been shown for Jalandhar, Kapurthala, Ludhiana and Patiala, while decreasing trend was reported for the districts Amritsar and Fatehgarh. For Phagwara in Kapurthala district, mean maximum and minimum temperature for summer season and winter se2asons respectively showed increasing trend at the rate of 0.08 and 0.37°C per year for the period 2009-2018. However highest average monsoon rainfall (1721mm) in Phagwara was received during 2018 followed by 2010 and least rainfall (243.6mm) was received during the year 2016.

***Key words**: Districts, Punjab. Rainfall and temperature*

INTRODUCTION

Green house gas emission, global warming, glacier melting, floods, droughts, heat and cold waves, cloud bursting are the common words which are reverberating around us in every nook and corner. These abiotic changes cause a huge change in plant, animals and human lives. It is predicted that this warming will increase upto one and half degree celsius more as compared to what was during pre industrial period till mid of this century. Limiting this warming at this stage, can prevent the billion of lives form climate risks. Human beings and animals are dependent upon plants for their food, so if the crop plants providing food are protected, somehow target to save lives will be achieved.

Extreme weather events and climatic changes are affecting the whole world but intensity and frequency vary among the regions so the effect also. As reported by Chattopadhyay et al., 2019[1] noteworthy changes in temperature and rainfall pattern both site and time specific are observed recently more than as during 1951–1980 in India. Haris et al 2010[2] observed increasing trend in

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rainfall and minimum temperature by analyzing 45 years data in Bihar. During January, cooling of range –0.05° to –0.08°C/year in Punjab was observed. Rainfall in post-monsoon season exhibits decreasing trend in some agroclimatic zones of Punjab, Haryana and the hilly regions of Jammu and Kashmir. Punjab is composed of six agro-climatic regions viz. Sub-Mountainous undulating region, undulating plain region, central plain region, western plain, western region and flood prone region. The rainfall analysis for some districts of Punjab has showed increasing rainfall trends in all season [3].

Annual mean maximum as well as minimum temperature for 1951-2010 showed decreasing pattern in Punjab. Annual rainfall also falls over Punjab during 1951-2010 study [4]. Jain and Kumar,2012[5] studied rainfall trend in fifteen basins of India and concluded that 14 out of these had declining trend, however, increasing trend of rainfall in annual and southwest monsoon season during 1901-1982 over sub-divisions of Punjab and Haryana[6]. Pattanaik, 2007 [7] found declining monsoon rainfall over northwest and central India during from 1941–2002. Any significant change was not found in rainfall (annual, season and monthly) after analysis of long time period from 1871-2005 in India[8]. Pant and Kumar, 1997[9] analyzed the seasonal and annual air temperature for more than 100 years have shown significant temperature trend of 0.6°C and scale of temperature was higher in the after-monsoon and winter seasons. Mean annual surface air temperature for 82 years (1901-1981) showed decreasing trend over the northwest Indian region[6].

MATERIAL AND METHODS

Weather data was taken for the study period online from the websites likes indiawaterportal and weatheronline.

RESULTS AND DISCUSSION

Trends analysis for rainfall

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The current study aims to study rainfall and temperature trends in 15 districts belong to different agroclimatic regions of Punjab. Figure 1 (a-g) showed the rainfall trend for monsoon season from 2004-2010 and it was observed that maximum rainfall (1094 mm) received in Patiala followed by Gurudaspur district. By comparing the rainfall during monsoon period over all the years under study, the year 2008 was rainiest with 1094 mm followed by rainfall (926.2 mm) during 2010. Least rainfall (26mm) was received by Faridkot district in 2005. In central plain zone of Punjab (Fig 2 and 3) showed that Amritsar and Fatehgarh districts showed decreasing trend in rainfall with 1.59 mm and 5.39 mm decline per year respectively. While in districts, Jalandhar, Kapurthala , Ludhiana and Patiala , increase in monsoon rainfall trend was observed to the tune of 9.87,34.68,36.28 and 22.33 mm per year respectively.

For station Phagwara, data for 2009-2018 (Fig 4 & 5) was analyzed and it was found that highest total monsoon rainfall (1720.7 mm) was received during 2018 followed by 2010.Number of rainy days were highest (93) per season during 2011 and least number of rainy days were during 2017 with 53 days of rain per season.

Trends analysis for temperature

The observed data was analyzed from the period 2009 to 2018. During the summer season Figure 8 showed that the mean maximum was highest (40^oC) during the year 2010 followed by temperature (39^oC) during the year 2016.For the months of March, April and May the highest value of maximum temperature observed was 34, 41 and 44^o C respectively for the period 2009-2018 in Phagwara during the winter months. it has been observed that lowest mean minimum temperature was 10^oC . Mean minimum temperature for the November, December and January months showed increasing trend of temperature (0.25^oC, 0.49^oC and 0.36^oC per year) respectively.

CONCLUSION

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The results of this study revealed that districts belong to different agroclimatic regions of Punjab have experienced different trends in both in rainfall and mean maximum and minimum temperature.

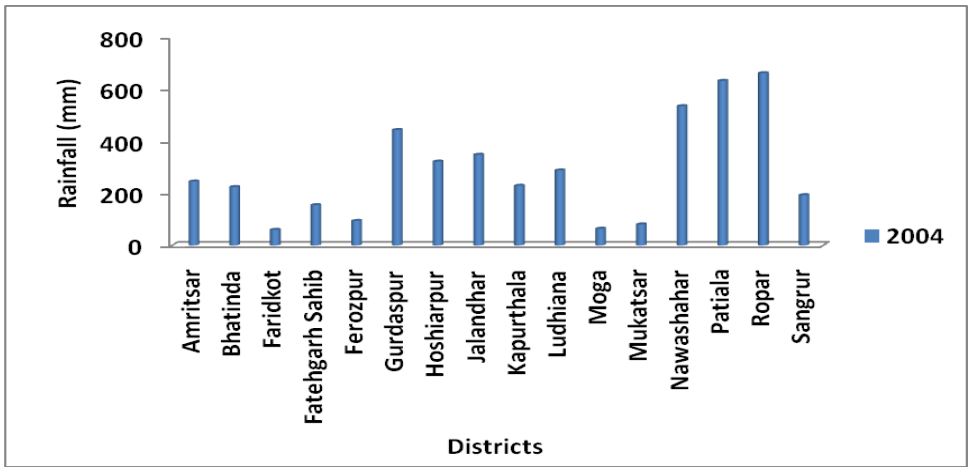

Fig 1 (a). Rainfall in different districts during 2004

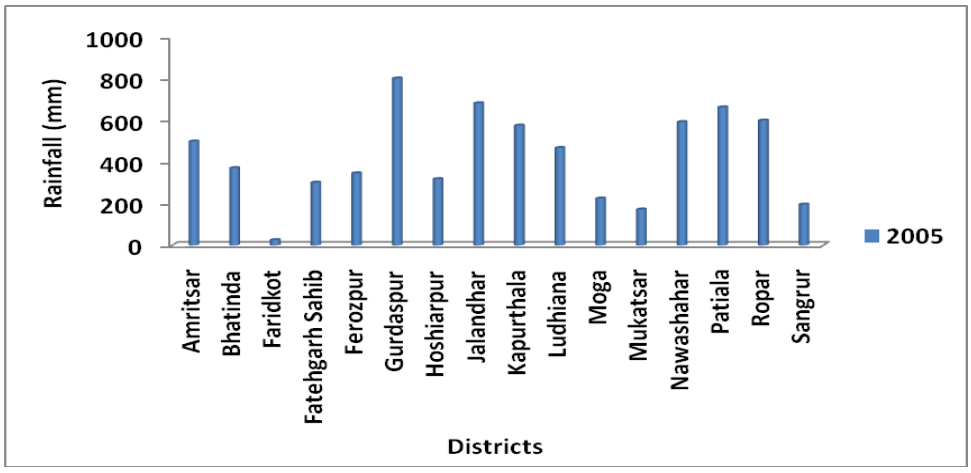

Fig 1 (b). Rainfall in different districts during 2005

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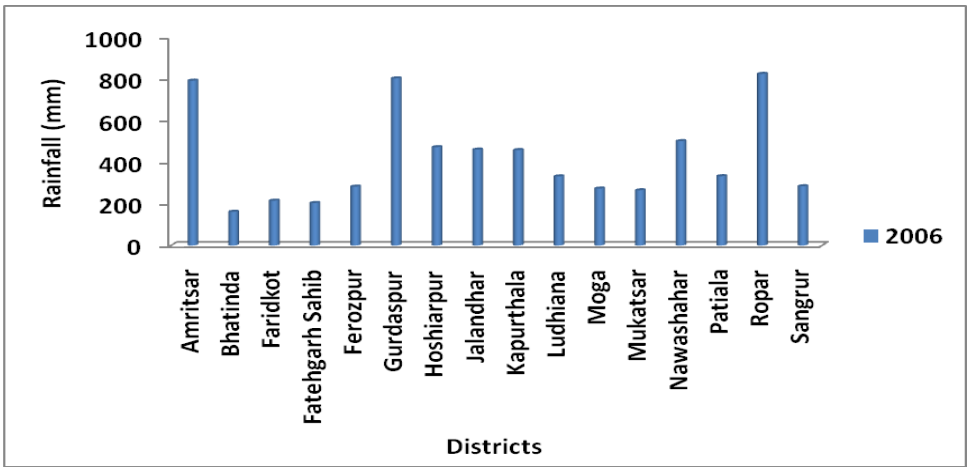

Fig 1 (c). Rainfall in different districts during 2006

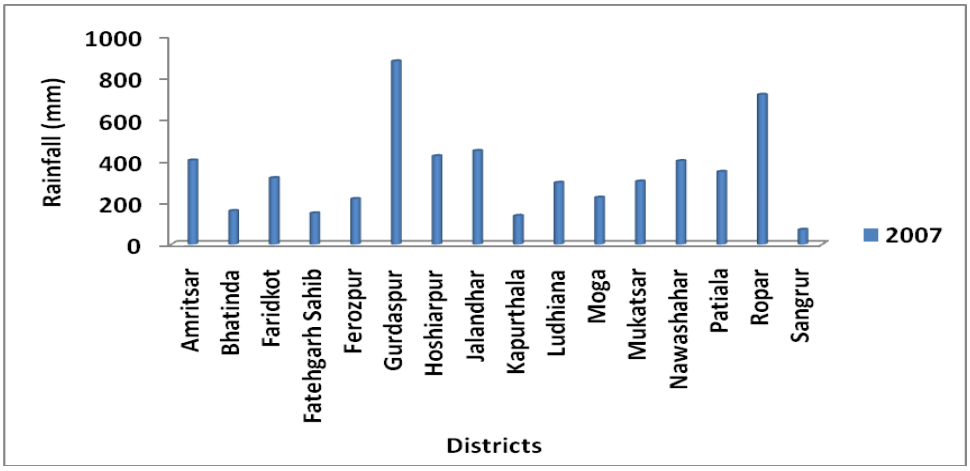

Fig 1 (d). Rainfall in different districts during 2007

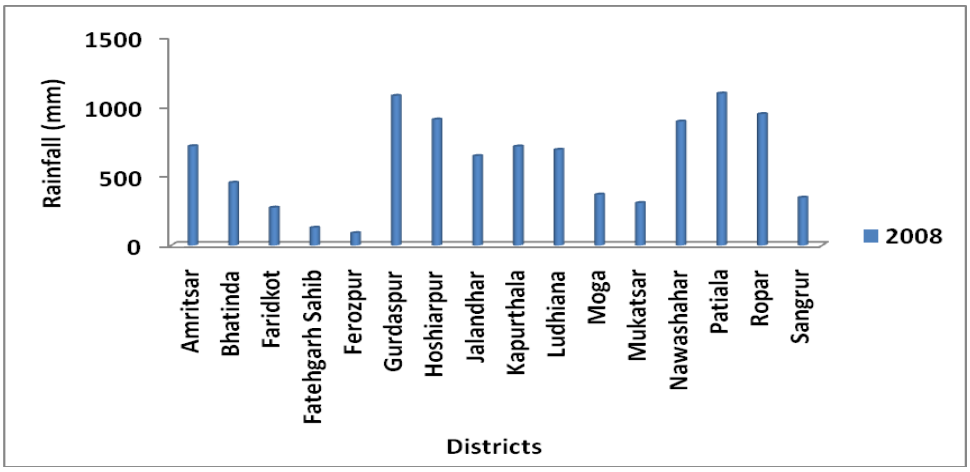

Fig 1 (e). Rainfall in different districts during 2008

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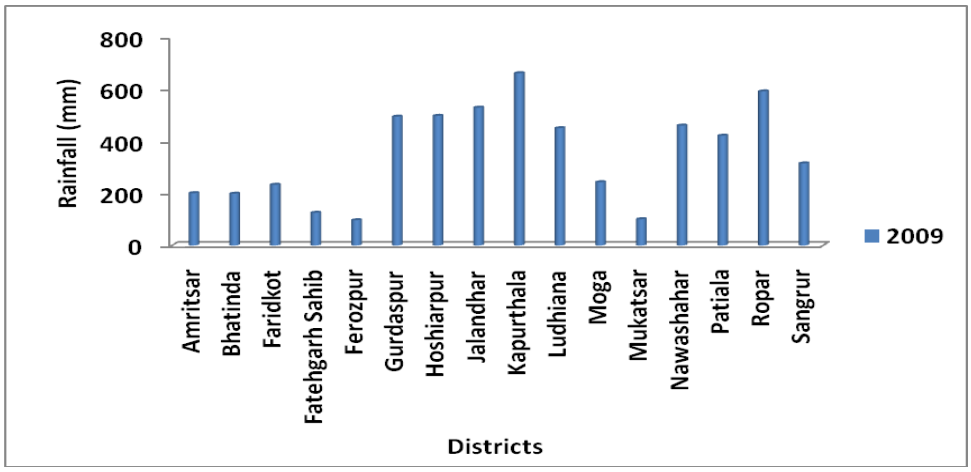

Fig 1 (f). Rainfall in different districts during 2009

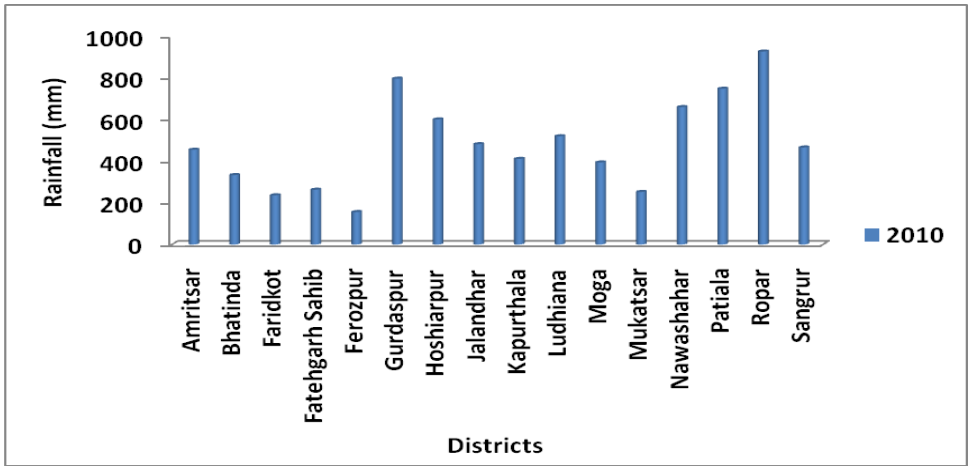

Fig 1 (g). Rainfall in different districts during 2010

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Fig 2. Monsoon rainfall in central plain zone of Punjab

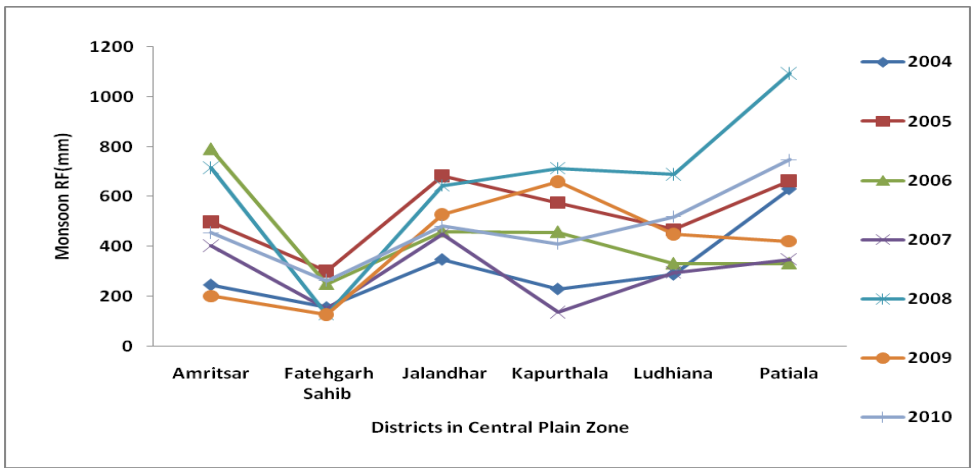

Fig 3. Monsoon rainfall trend in the districts under central plain of Punjab

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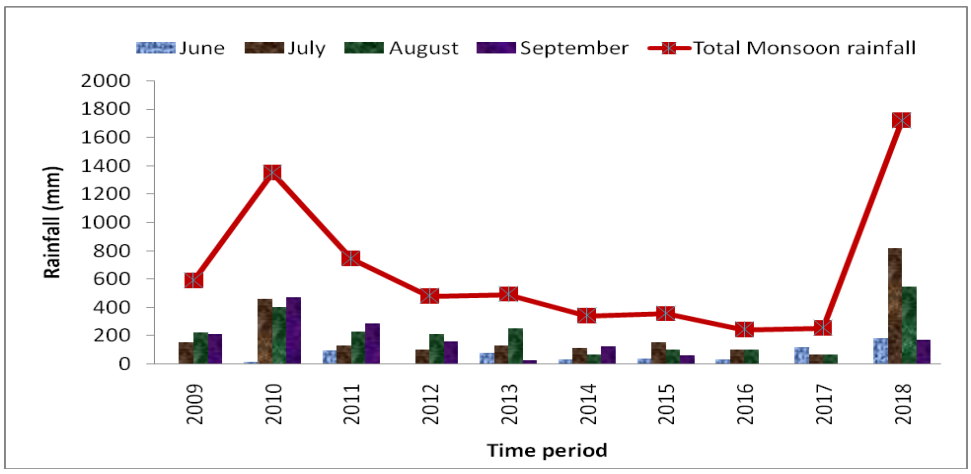


Fig 4. Monsoon rainfall in Phagwara from 2009-18

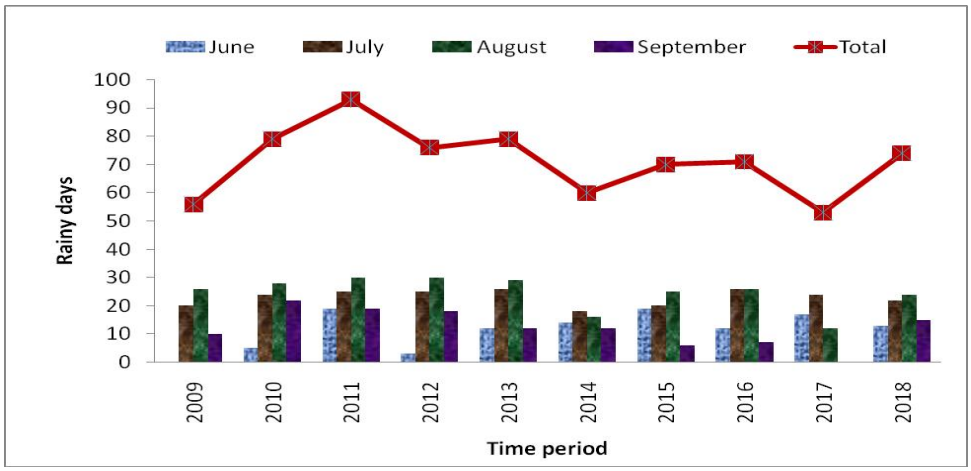
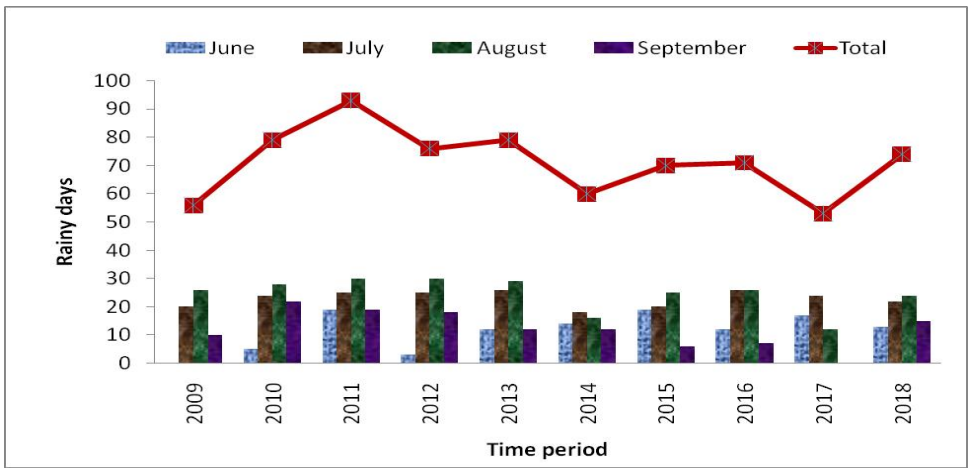


Fig 4. Monsoon rainfall in Phagwara from 2009-18



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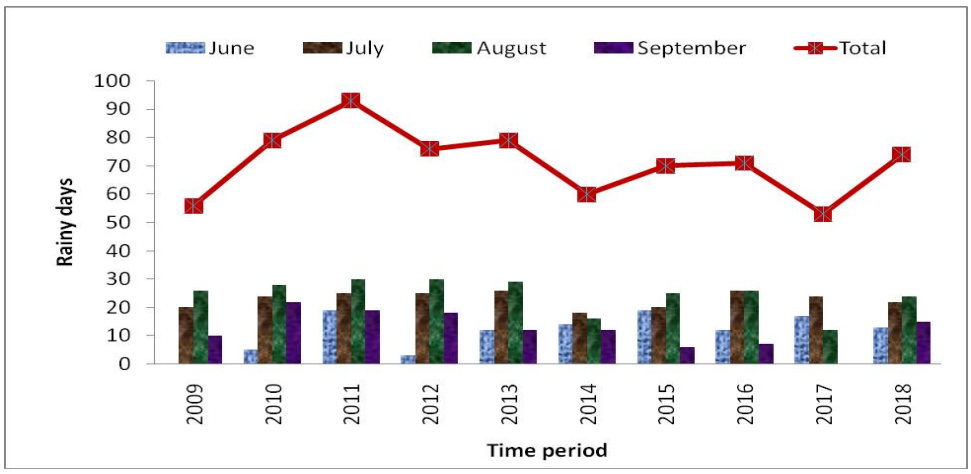

Fig 4. Monsoon rainfall in Phagwara from 2009-2018

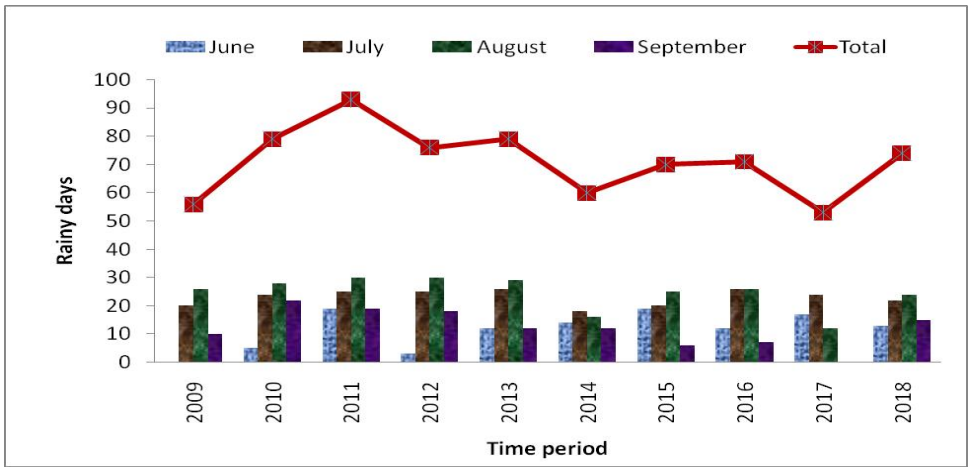

Fig 5. Number of rainy days in Phagwara for 2009-2018 time period

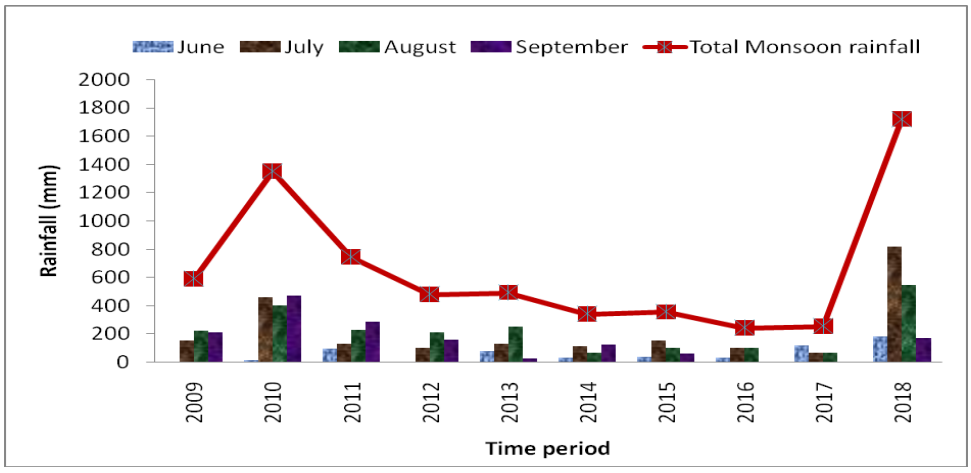

Fig 6. Monsoon season rainfall trend in Phagwara (2004-2010)

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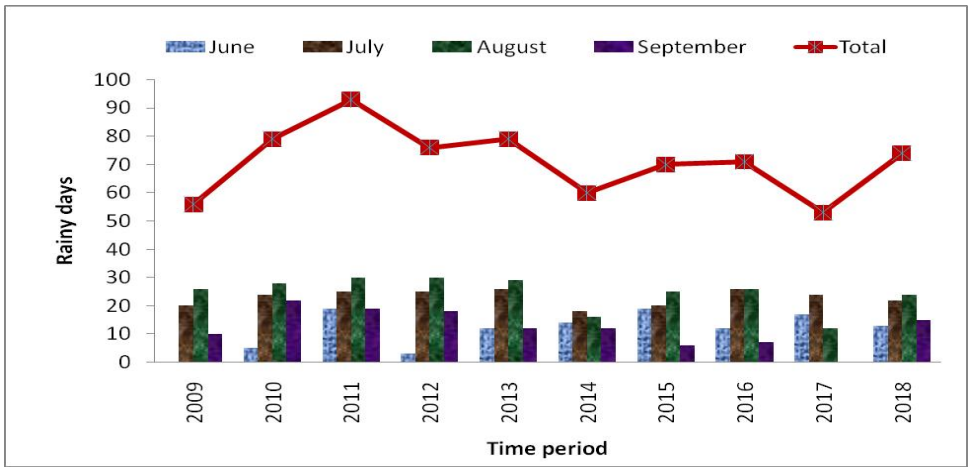

Fig7. Number of rainy days during monsoon season in Phagwara (2004-2010)

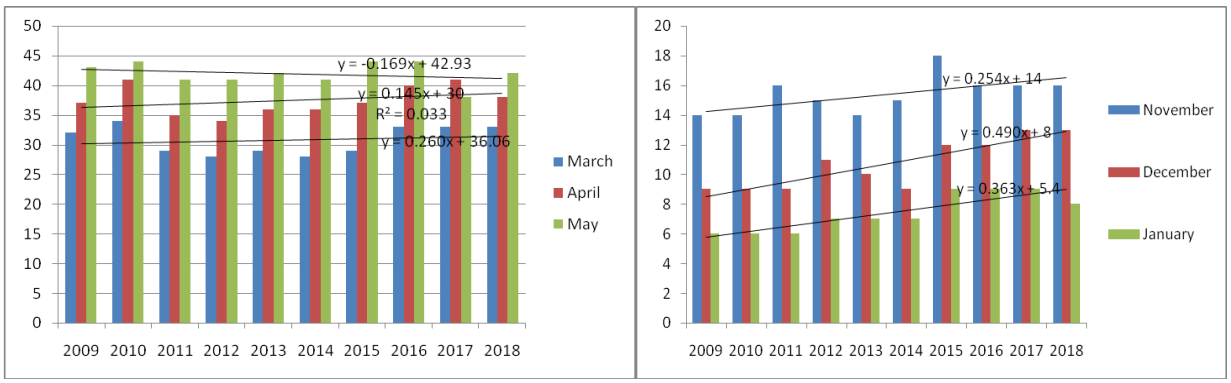

Fig 8. Mean maximum and mean minimum temperature for summer and winter (2009—2018)

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