CRIMSON PUBLISHERS
Wings to the Research

Environmental
Analysis & Ecology Studies

ISSN 2578-0336

Mini Review

Climate Change Impact on Physiological and Morphological Traits of Agronomic Crops

Imran[1]*, Asad Ali Khan[1] and Hayat Zada[2]

[1]*Department of Agronomy, Pakistan*

[2]*Department of plant protection, Pakistan*

***Corresponding author:** Imran Ahmad, Department of Horticulture, Pakistan

Submission: January 28, 2018; **Published:** August 17, 2018

Abstract

Climate change is a gigantic challenge and threat for food security throughout the globe. Climate change induced by human activities either by natural system manipulation like deforestation, urbanization, industrialization, diversion of behavior for comfortable life passing and by more greenhouse gases (GHG) emission for calmness in life. On the other hand with the calmness in life, changed the Earth's atmosphere and produced aerosols (small particles), and cloudiness in the atmosphere. These aerosol caused global warming and effected agricultural productivity at regional level. There may be a vigorous growth of some crops in raised CO2 conditions, but there is a trade-off because as temperature rises seed production may be drop especially of maize and soybean in tropical regions. Shifting, vanishing and endangering of the marginal crops is increasing rapidly which a big challenge and threats towards food security. Average temperature of the Earth, Which has been increasing for many years [1].

In this Context present study was investigated at reginal level of district swat to evaluate the impact of changing climate on crop productivity at various location and crop responses to the changing climate. It was concluded and suggested that production of maize, soybean tomato, cucumber, squashes, peas, French bean [2], canola and pulses are vulnerable to extreme temperature and drought stress. Therefore climate change is a real fact confronting to agriculture productivity. So proper management with biochar, soil amendments, charcoal and other organic matter will might be promote root density, and will result in more number of roots having more water and nutrients absorption and will ultimately reduce the impact of changing climate [3-8].

Keywords: Climate change; Maize; Soybean; Yield; GHG; Aerosols

Introduction

Climate refers to the average weather conditions in a place over many years (usually at least 30years, to account for the range of natural variations from one year to the next) [9-11]. For example, the climate in Swat Pakistan (Especially upper swat) is cold and snowy in the winter, while Peshawar Pakistan climate is hot and humid. The climate in one area, like the Swat or Peshawar, is called a regional climate. The regional climate have great importance in respect of agricultural productivity, food security, and livelihood. Recent studies have showed that plants and crop responded positively to reginal climate and showed ameliorating effect in term of grain yield, plant height, thousand grain weight, dry matter portioning, biological yield, oil yield, and quality of the crops [12].

A significant change in the Earth's climate is occurring slowly and gradually and influencing life on the planet earth. Climate can be defined as "expected weather". When changes in the expected weather occur, known as climate changes. They can be defined by the differences between average weather conditions at two sep arate times. Climate may change in different ways, over different time scales and at different geographical scales. In recent times, scientists have become interested in global warming, due to mankind's impact on the climate system, through the enhancement of the natural greenhouse effect. The Earth is currently getting warmer because people are adding heat-trapping greenhouse gases to the atmosphere. The term "global warming" refers to warmer temperatures, while "climate change" refers to the broader set of changes that go along with warmer temperatures, including changes in weather patterns, the oceans, ice and snow, and ecosystems around the world, Imran et al. [1].

The average climate around the world is called global climate. When scientists talk about global climate change, they're talking a pattern of changes happening around the world over many years. One of the most important trends that scientists look for it is the average temperature of the Earth, which has been increasing for many years. The increase in temperature adversely effected all sec-

tors of life but the most vulnerable is agriculture. Water shortage is enhancing day by day due to climate change at arid, and semi-arid region which leads to demolish crop production practices.

How Climate Change is a Threat and Challenge for Food Security

The global warming caused by climate change is likely to affect crops throughout the life cycle due to increased temperature, moisture stress, heat waves, the possible emergence of new major insect-pests and disease [13]. It has been reported that mungbean has high nutritive value, and due to this, has advantage over the other pulses known as king of the pulse crop. The seed contains 24.20% protein content, 1.30% fat, and 60.4% carbohydrates; calcium (Ca) is 118 and phosphorus (P) is 340 mg per 100 g of seed but due to increase in temperature the quality and production potential of the crop going to decline. The quality of crops were examined by and [1-6]. They have been reported that pulses are known as poor man's meat and cheap source of vegetable protein containing 20-25% protein.

Its production is very low in many regions due to miss management of the inputs. Therefore, if farmers implement more number of tillage practices as compared to conventional, so the nutrients demand will be fulfilled by the leached and adsorbed nutrients, away from root zone by pulverizing the soil, whereas the productivity of the soil will also increase with soft soil, promote root density, and will result in more number of nodules having more nitrogen fixation and will ultimately reduce the impact of changing climate Imran et al. [2].

Response of Germination to Changed Climate

Crop seeds germinate in a particular range of temperature. Increase in soil temperature by global warming will adversely affect germination and therefore crop stand will be effected respectively. For example, groundnut which is a major crop of KP has an optimum temperature of 25-30 ^{o}C for germination. Increase in temperature beyond this range during the sowing time will adversely affect crop germination [14-18]. They have reported thatCanola cultivars positively responded in optimum temperature range to sulphur fertilization in term of seed yield and oil quality [19-22]. Concluded that Oscar cultivar increased seed yield 53% as compared to control plots when there were no fluctuation in temperature. Sulphur at the rate of 45kg ha^{-1} increased seed yield, biological yield, and quality of rapeseed.

Imran et al. [1,2] revealed that in optimum temperature number of days to flowering (76), number of pods plant^{-1} 372), number of seeds pod^{-1} (24), plant height (173 cm), biological yield (15547kg ha^{-1}), seed yield (2209kg ha^{-1}), index (19%), glucosinolate (µmol g^{-1}) content (31.03µmol g^{-1}) and oil content (45.81%) was significantly with sulphur treated @45kg ha^{-1} applied plots as compared to delayed flowering (78 days), shortest (151 cm), pods formation (298 pods), seed pod^{-1} (21), biological yield (11090kg ha^{-1}), seed yield (1436kg ha^{-1}), and oil content (42.62%) in control plots. Among cultivars "Oscar" ranked first in growth stages and attain more plant height (164cm), and examined substantial number of pods plant^{-1} (359), seeds pod^{-1} (24), seed yield (2005kg ha^{-1}), biological yield (14298kg ha^{-1}), harvest index 17%, and oil content 46.29%) as compared to other sowed cultivars. On the basis of the result it is recommended that cultivar "Oscar" treated with sulphur @45kg ha^{-1} should be applied for higher yield and quality of rapeseed under agro-climatic condition of swat valley [19].

Response of Changed Climate towards Growth and Development

Temperature higher than the optimum range adversely affects growth and development of plants due to harmful effects on plant metabolic activities. The rate of photosynthesis may get more sluggish as the temperature increases due to closure of stomata. Besides, higher temperature enhances the rate of evapotranspiration causing moisture stress in plants under rain-fed situations. Also at higher temperature the dry matter accumulation becomes less. shoot cutting duration after date of sowing (ADS), (no cutting, 30days ADS, 40days ADS, 50days ADS and 60days ADS) were used in the experiment with the test cultivar Dunkled [20]. From the results it is observed that rapeseed cultivar positively responded for days to flowering, days to maturity, number of branches plant-1, H.I%, number of seeds pod^{-1}, seed weight (g), biological yield (kg ha^{-1}), seed yield (kg ha^{-1}) and oil yield (kg ha^{-1}) to biochar levels maximum seeds pod^{-1} (23 seeds), thousand seed weight (3.59g), biological yield (10310kg ha^{-1}), seed yield 1169kg ha^{-1}) and oil yield (600kg ha^{-1}) was observed in plot treated with 10ton biochar ha^{-1}. Whereas minimum seeds pod^{-1} (15 seeds), thousand seed weight (2.41g), biological yield (6725kg ha^{-1}), seed yield (923kg ha^{-1}) and oil yield (401kg ha^{-1}) was recorded in control plot [21-25].

Similarly highest seeds pod^{-1}(22), thousand seed weight (3.3g), seed yield (1099kg ha^{-1}) was noted in no shoot cutting plot followed by shoot cutting after 60 days of sowing ADS plots while promising biological yield (9025kg ha^{-1}), and oil yield (568kg ha^{-1}) was recorded in shoot cutting after 50days ADS and after 60days ADS of sowing. On the basis of the result it was concluded that shoot cutting with 10ton biochar ha^{-1} produced highest seed and oil yield with green chop and recommended for higher seed, oil and biological yield in the agro-climatic condition of swat valley [26-28].

Response towards Plant Reproduction

Higher temperature has harmful effects on flowering, pollination, fruit setting, and maturation. Higher temperatures may increase flower and fruit dropping in some crops, and cause stigma and pollens to dry [23-30]. The anthelmintic activity was very significant against the tested earthworms. Leaf extracts of Iphionagrantioides and P. Argutaat dose of 100/ml caused death of the worms in 3.33±0.57 and 2.16±0.28 minutes, respectively, which is similar to the effect produced by commercial anthelmintic drug, Piperazine Citrate.

Indicated that both the plants have significant antilice potential by showing 100% lice mortality in case of Iphionagrantioides leaf followed by its flower (96.67%) and of Plucheaarguta by causing 93.33% lice mortality. Iphionagrantioides showed excellent insecticidal (90%) activity against Callosobruchusanalis, Rhyzo-

perthadominica, Sitophilusoryzae and Triboliumcasteneum. Plucheaarguta leaf exhibited significant activity against all the tested insect species. The results also depicted excellent effect of both the plants by inhibiting growth of Lemna minor [31]. Plant extracts of the plants displayed significant cytotoxicity against brine shrimps. The LD 50values for all the crude extracts of Iphiona grantioides and Pluchea arguta subsp. glabra were found to be 34.65, 242.83, 6.21, 29.92ug/ml and 0.02, 0.03 and 84.66 ug/ml respectively. The present studies showed that ethanolic extracts of Iphionagrantioides and Plucheaargurasub sp. Glabra revealed significant potential regarding anthelmintic, antilice, insecticidal cytotoxic and phytotoxic activity and these plants could be exploited for herbal drugs exploration for the health care of mankind [32].

Response towards Crop Duration

The increase in temperature will speed the maturity, so cutting the total duration of the crop. It will result in lower dry matter accumulation and lower yield. The effect of nitrogen on days to flowering was significant. With increase in nitrogen level significant delayed were noted in days to flowering [33]. Plots treated with different decapitation stresses delay days to flowering as compared to plots. The interaction between nitrogen levels and decapitation stress on days to flowering were also found significant with 100 kg nitrogen level and 5cm decapitation stress shows maximum (111) days to flowering. This might be due to maximum nitrogen enhances vegetative growth and delayed reproductive phase. This statement are supported by Ahmadi and Bahrani (2009) who's reported the effect of nitrogen levels and concluded that highest N level enhanced plant height, number of branches plant-1and maximum days to flowering [34-38].

Response towards Crop Yield and Productivity or Total Biomass

Lower plant stand due to poor germination, low dry matter accumulation, adverse effects on flowering and fruiting, reduced crop duration caused by an increase in temperature will ultimately reduce the crop yield. Still, in case of C3 plants the enhanced level of CO_2 may result in higher rate of photosynthesis and increase yield. But such effects of CO_2 fertilization may get negated due to higher temperature and moisture stress caused by climate change [39-43] examined that regional climate is very important for an ideal crop growth and production. Five different crop average yield grown and different elevation and topography with different rainfall pattern and temperature. Difference in the average temperature of a locality have significant effect on crop growth, yield and productivity [44-46].

References

1. Imran I, Khattak I, Hussain A, Rehman S, Anwar F, et al. (2015) Growth and Yield of Maize Hybrids as effected by different Sowing Dates in Swat Pakistan. J Pure & Applied biology 4(4).
2. Imran I, Hussain I, Khattak A, Rehman F, Ahmad SST (2015) Roots nodulation, yield and yield contributing parameters of mungbean cultivars as influenced by different phosphorous level in swat-Pakistan. J Pure & Applied biology 4(4).
3. Imran (2017) Climate change is a real fact confronting to agricultural productivity. Int J Environ Sci Nat Res 3(3): 555613.
4. Lal R (2001) Potential of desertification control to sequester carbon and mitigate the greenhouse effect. Climatic Change 51(1): 35-72.
5. Lockwood J (2012) Atmospheric moisture. In: Holden J (Ed.), An introduction to physical geography and the environment Pearson, Harlow, England, p. 875.
6. Marengo J (2006) On the hydrological cycle of the amazon basin: a historical review and current state of the art. Revista Brasileira de Meteorologia 21(3): 1-19.
7. Shaw EM, Beven KJ, Chappell N, Lamb R (2010) Hydrology in practice. CRC Press, London.
8. Trenberth KE, Smith L, Qian T, Dai A, Fasullo J (2007) Estimates of the global water budget and its annual cycle using observational and model Data. J Hydrometeor 8: 758-769.
9. Visualising carbon pathways: Interesting resource which allows students to create animations of parts of the carbon cycle.
10. Imran, Ali Khan A, Fayaz A (2015) Phenology of various rice genotypes as affected by different transplanting dates under cold climatic region of khyber pakhtunkhwa Pakistan. J Environ and E Science ISSN 2224-3216 (Paper) ISSN 2225-0948.
11. Imran (2015) Effect of germination on proximate composition of two maize cultivars. J Bio Agric and Helathcare 5(3): 123-128.
12. Abbot CG (1910) The solar constant of radiation. Smithsonian Institution Annual Report, p. 319.
13. Ackerman T, Stokes G (2003) The Atmospheric radiation measurement program. Phys Today 56: 38-44.
14. Imran, Asad AK (2015) Phenological charateristics of brassica napus L. as influenced by biochar application and shoot cutting duration (days). Civi and Environ Res. ISSN 2224-5790 (Paper) ISSN 2225-0514.
15. Imran AAK, Fayaz A, Irfanullah (2015) Influence of hydrated calcium sulphate ($CaSO_4.2H_2O$) and nitrogen levels on water infiltration rate and maize varieties productivity in rainfed area of swat, Pakistan. Chem and Envrn Res. ISSN 2224- 3224 (Print) ISSN 2225- 0956 (Online).
16. Adkins JF (1998) Deep sea coral evidence for rapid change in ventilation of the deep North Atlantic 15, 400years ago. Science 280: 725-728.
17. Barnett TP (1999) Detection and attribution of recent climate change: A status report. Bull Am Meteorol Soc 80: 2631-2660.
18. Imran AAK, Fayaz A, Irfanullah (2015) Nitrogen levels, tillage practices and irrigation timing influenced yeild, yeild components and oil contents of Canola. CivI and Environ Res. ISSN 2224-5790 (Paper) ISSN 2225-0514.
19. Imran, Fazal M, Muhammad U, Hayat Z (2015) Farmers income enhancement through off-season vegetables production under natural environment in swat-Pakistan J Environ and E Science ISSN 2224-3216 (Paper) ISSN 2225-0948.
20. Barnola JM, Raynaud D, Korotkevich YS, Lorius C (1987) Vostok ice core provides 160,000 year record of atmospheric CO_2. Nature 329: 408-414.
21. Imran, Asad AK (2015) Influence of compost application and seed rates on production potential of late sown maize on high elevation in swat Pakistan. J Environ E Science ISSN 2224-3216 (Paper) ISSN 2225-0948.
22. Battle M (1996) Atmospheric gas concentrations over the past century measured in air from firm at South Pole. Nature 383: 231-235.

23. Imran, Asad AK (2015) Grain yield and phenology of maize cultivars influenced by various phosphorus sources. Food sci and quality management. ISSN 2224-6088 (Paper) ISSN 2225-0557.

24. Imran, Asad AK (2015) Biochar application and shoot cutting duration (Days) influenced growth, yield and yield contributing parameters of Brassica Napus L. J Bio Agric and H care ISSN 2224-3208 (Paper) ISSN 2225-093X (Online).

25. Bender M (1996) Variability in the O^{-}_{2}/N_{2} ratio of southern hemisphere air, 1991-1994: Implications for the carbon cycle. Global Biogeochem. Cycles 1: 9-21.

26. Berger A, Loutre MF, Gallée H (1998) Sensitivity of the LLN climate model to the astronomical and CO2 forcing over the last 200k yr Clim Dyn 14: 615-629.

27. Imran, Khan AA, Ullah I, zada H, Ahmad F, et al. (2015) Yield and yield attributes of rapeseed cultivars as influence by sulfur level under swat valley conditions. J Pure & Applied biology 4(3).

28. Iqbal A, Amanullah, Ali A, Iqbal M, Ikramullah, et al. (2017) Integrated use of phosphorus and organic matter improve fodder yield of moth bean (Vigna aconitifolia (Jacq.) under irrigated and dryland conditions of Pakistan. Journal of Agri Search 4(1): 10-15.

29. Imran, Shahida N, Asad AK, Inayat K (2015) Impact of phosphorus levels and seed rates on growth and yield of late sown maize on high elevation in swat, Pakistan. Pakistan J Agric Res 28(4): 406-413.

30. Iqbal, Mohammad TJ, Muhammad Z, Asad AK, Shazma A, et al. (2016) Phenological traits of Maize influenced by integrated management of compost and fertilizer Nitrogen. J Pure & Applied biology 5(1): 58-63.

31. Samreen, Muhammad I, Lalbadshah, Shahida N, Imran, et al. (2016) Ethnobotanical study of subtropical hills of Darazinda, Takht-e-Suleman range FRDI Khan, Pakistan. Pure and Applied Biology 5(1): 149-164.

32. Anwar, Israeel, Babar I, Asad AK, Imran, et al. (2016) Nitrogen and phosphorus fertilization of improved varieties for enhancing phenological traits of wheat. Pure and Applied Biology 5(3): 511-519.

33. Khan AZ, Imran, Asim M, Aiman K, Hasina G, et al. (2016) Impact of fertilizer priming on seed germination behavior and vigor of maize. Pure and Applied Biology 5(4): 744-751.

34. Imran AAK, Inamullah, Luqman (2015) Weeding stages and their effect on yield and yield components of rice in upper Swat, Pakistan. Pak J Weed Sci Res 21(4): 555-563.

35. Imran AAK, Khan IU, Naveed S (2016) Weeds density and late sown maize productivity influenced by compost application and seed rates under temperate environment. Pak J Weed Sci Res 22(1): 169-181.

36. Iqbal, Bashir A, Inam U, Imran, Asad AK, et al. (2016) Effect of phosphorus, sulphur and different irrigation levels on phenological traits of triticale. Pure and Applied Biology 5(2): 303-310.

37. Imran, Zada H, Naveed S, Khattak I, Ahmad S (2016) Variable rates of phosphorous application influenced phenological traits of green gram (Vignaradiata L.). Open Access Journal of Agricultural Research 1(3): 1-5.

38. Naveed, Muhammad I, Inayat K, Imtiaz K, Imran, et al. (2016) Anthelmintic, antilice, insecticidal, cytotoxic and phytotoxic potential of ethanolic extracts of two wild medicinal plants iphiona grantioides and plucheaarguta. J Woulfenia 11(23): 13-25.

39. Imran, Asad AK, Inamullah I, Fayaz A (2016) Yield and yield attributes of mungbean (Vigna radiata L.) cultivars as affected by phosphorous levels under different tillage systems. Cogent Food & Agriculture 2(1): 115-1982.

40. Khan AA, Khan MN, Uallah I, Shah S, Arshad IR, et al. (2015) Effect of potash application on growth, yield and yield components of spring maize hybrids. Pure and Applied Biology 4(2): 195-203.

41. Baqa, Amir ZK, Inamullah, Imran, Asad AK, et al. (2015) Influence of farm yard manure and phosphorus application on yield and yield components of wheat. J Pure & Applied Biology 4(4).

42. Iqbal, Muhammad TJ, Inamullah, Imran, Asad AK (2015) Integrated management of compost type and fertilizer-n in maize. J Pure & Applied Biology 4(4).

43. Imran, Asad AK, Irfanullah, Fayaz A (2014) Production potential of rapeseed (brassica napus L.) as influenced by different nitrogen levels and decapitation stress under the rainfed agro-climatic condition of swat Pakistan. J Glob Innov Agric Soc Sci ISSN (Online): 2311-3839.

44. Asad AK, Imran F, Ali Shah I, Laiq Z, Muhammad N, et al. (2015) Phenological traits of rice as influenced by seedling age and number of seedling per hill under temperate region. J Bio Agric and H care.

45. Imran, Asad AK, Kashif A, Sajjad Z, Shah F, Shahzad A (2015) Rice seedling characteristics of various genotypes influenced by different sowing dates in swat-Pakistan. J Environ and E Science.

46. Imran (2015) Influence of nitrogen levels and decapitation stress on biological potential of rapeseed (Brassica Napus L) under water difficit condition of swat-Pakistan. J N Sci Res.