



ISSN:2456-9739

BRITISH JOURNAL OF BIO-MEDICAL RESEARCH

Cross Ref DOI: <https://doi.org/10.24942/bjbmr.2021.868> Volume 05, Issue 04, July - August 2021

Research Article

Assessing the Impacts of Climatic Change Status of Medicinal Plants in Illuababor Zone and Bunobedele Zone of South West Ethiopia

Raju. NJ^{1*}, Manjoor Ahamad .S², Angala Parameswari .S³, Leta Deressa .T⁴

^{1,2,3}Department of Pharmacy, College of Health Sciences, Mettu University, Oromia, Ethiopia.

⁴Academic Vice President (Student Affairs), Mettu University, Oromia, Ethiopia.

⁴Department of Chemistry, College of Natural & Computational Science, Mettu University, Oromia, Ethiopia.

ARTICLE INFO

Article History:

Received on 14th July 2021

Peer Reviewed on 27th July 2021

Revised on 11th August 2021

Published on 29th August 2021

Keywords:

Climate change, temperature, rainfall, medicinal plants, Ethiopia

ABSTRACT

Ethiopia is endowed with rich flora and fauna, due to its physical and climatic diversity. The total number of vascular plants is estimated to be more than 6500 species out of which an estimated 10% are endemic and about 14% are used as medicinal plants. Impacts of climate change are serious issues especially in this region and the resultant effects are on the natural resource equally. However, there is very limited research related to this in Illuababor zone and Bunobedella zone of Ethiopia. This research was objectively conducted to assess the trend of temperature, rainfall and their impact on production of medicinal plants. Observation, household survey and FGD were applied to collect primary data. While secondary data was

collected from Ethiopian biodiversity and other related governmental agencies and authorities. The recorded temperature was the highest 18.7^oC in 2020 which was the lowest only 5.0^oC in 2000. *Acacia*, *Cucumis*, *Lagenaria*, *Veronina*, *Withania* these medicinal plants growth effected due to the temperature. The estimated annual rainfall was deceasing by -5.1313 mm every year from 2000 to 2020. In fact, it was the highest 1950 mm which was declined to 850 mm in years 2000 and 2020. *Artemisia*, *Doviyalis*, *Erythrina*, *Rubus*, *Steganotaenia* these medicinal plants production affected due to the rainfall. The impacts of climate change was positive as well as negative on the production of medicinal herbs. Therefore, this study used to understand the impact of climate change status of medicinal plants in Illuababor zone and Bunobedella zone of Ethiopia.

Br J Bio Med Res Copyright©2021 **Raju. NJ** et al. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (<http://creativecommons.org/licenses/by/4.0/>), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

Corresponding Author: Dr. Raju. NJ, Associate Professor, Department of Pharmacy, College of Health Sciences, Mettu University, Oromia, Ethiopia.

INTRODUCTION

The terms “global warming” and “climate change” are often used interchangeably, “climate change” is often the preferred term of many environmental organizations and government agencies [1]. Climate change refers to any significant change in measures of climate (such as temperature, precipitation, or wind) over an extended period of time (decades or longer). Global warming refers to an increase in the temperature of the atmosphere that can contribute to change in global climate patterns. The Intergovernmental Panel on Climate Change considers “climate change” to mean any change in climate over time, whether due to natural variability or as a result of human activity (IPCC 2007). The United Nations Framework Convention on Climate Change defines “climate change” as a change in climate that is attributable directly or indirectly to human activity that alters atmospheric composition [2].

There have been worldwide changes in seasonal patterns, weather events, temperature ranges and other related weather and climate phenomenon and all has been reported and analyzed to global climate change [2].

Medicinal herbs are being impacted by the climate change so far. This in turn might bring uncertain and more effects on medicinal herbs in the future. As these tremendous changes of climate may place the life of medicinal herbs including we human being at great risk [2]. It is estimated that around 300,000 of plant species exist in the world and among them 21,000 species have the strength of being used as medicine [3,4]. In Ethiopia the knowledge of medicinal plants is commonly secretly passed orally from generation to generation. In this process valuable information can be lost whenever a medicinal plant is lost or when a traditional medical practitioner dies without passing, his/her indigenous knowledge to others [5]. On the other hand, pressures from agricultural expansion, construction, invasive alien species, modernization, wide spread cutting for fuel wood combined with seasonal drought have been reported by [6-8] as main factors for the depletion of medicinal plants. Hence,

documentation of indigenous knowledge and making herbaria for future use is also recommended to conservation of the declining medicinal plants [9]. And also, to create awareness on the contribution of traditional medical practice towards fulfilling the primary healthcare needs should be created among the youth [10]. It was pointed out that young generation has no interest to know about medicinal plants and efforts should be made to incorporate traditional medicine in school curricula so that younger people appreciate its usefulness [10].

The only means of curing diseases are local people’s traditional ways of using medicinal herbs. But recent years socio-economic transformation, Climate Change and weather variability as well as the changing life style of human beings leads to habitat fragmentation, overexploitation, overharvesting of medicinal herbs in Ethiopia. Over the last decades, the temperature in Ethiopia increased at about 0.2° C per decade. The increase in minimum temperatures is more pronounced with roughly 0.4° C per decade [11].

In addition to this, Ethiopia is highly vulnerable to the potential impact of Climate Change. However, there is gap in study related impacts of climate change on medicinal herbs in two regions or zones. Thus, this study was objectively to assess the trend and changes of rainfall and temperature and explore the impact of climate change on medicinal herbs production.

MATERIALS AND METHODS

Study site:

The study of assessing the impact of climate on medicinal herbs and their contribution to society and economy was carried out in the Buno bedele zone and Illuababor zone. The Bunobedele was created by 9 [districts](#) and 1 [town](#) in March 2016. The Zone covers 5,856.5030 square kilometres of which 1,126.64 square kilometres are covered by forests. Illubabor has a population density of 84.02, with an area of 15,135.33 square kilometers. Towns and cities in Illubabor include [Bedele](#), [Gore](#) and [Mettu](#). (Fig-1)

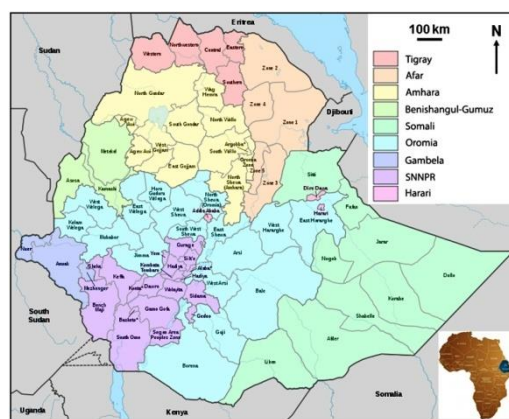


Fig-1. A representative map showing the zones of Ethiopia

Method of Data collection

The primary and secondary information were collected to carry out the research work. The data need was both qualitative as well as quantitative and hence the mixed method was applied to collect the data. This includes household survey, key informant interview, focus group discussion and observation.

Household survey

Study area consists of 201 households. Among them 40 households were surveyed. The respondents were non-randomly selected and semistructure questionnaire were asked to collect data and information from the people on climatic parameter and the impact posed to medicinal herbs. After the information, list of medicinal herbs collected by the users were noted to obtain valid data and to reduce error. The data was collected directly from the field.

Key Informant Interview

Total thirty five key informant interviews were carried out to collect the data related to impacts of climate change on medicinal herbs. The key informants were staff of division forest office, experts of medicinal herbs, users of community forests, collectors and business men. The check list related to impacts of climate change on medicinal herbs were prepared, examined and used to collect the data.

Focus Group Discussion

Two group discussions were conducted to collect the information regarding the impacts of climate change on medicinal herbs and hence the check list was prepared and used. The focus group

discussion was organized with the collector of the medicinal herbs.

Secondary Data Collection

Secondary data were collected from different journal, articles, books, websites, thesis reports, and annual reports from different agencies. Total 20 years Temperature data from 2000 to 2020 and rainfall data from 2000 to 2020 of Buno bedele zone and Illuababor zone were collected from National Meteorological Services Agency, Addis Ababa, Ethiopia.

Data analysis

The collected data were analyzed using the descriptive statistical analysis. The trend analysis and response of variation in production of medicinal herbs was correlated with the varying temperature and rainfall.

RESULTS

Maximum Temperature:

The trend analysis of maximum temperature was showed the increasing trend in Buno beadle zone and Illuababor zone. The recorded temperature was the highest 18.7 °C in 2020 which was the lowest only 5.0 °C in 2000. *Acacia*, *Cucumis*, *Lagenaria*, *Veronina*, *Withania* these medicinal plants growth effected due to the temperature. (Table-1 & Fig-2)

Annual Rainfall:

The estimated annual rainfall was decreasing by - 5.1313mm every year from 2000 to 2020. In fact, it was the highest 1950 mm which was decreased to 650 mm in 2000 and 2020. *Artemisia*, *Doviyalis*, *Erythrina*, *Rubus*, *Steganotaenia* these medicinal plants production affected due to the rainfall. (Table-1 & Fig-2)

Table-1: Impact of climate change on medicinal plants

S.No	Medicinal Plants	Impact of Climate Change
1.	<i>Acacia brevispica</i>	Temperature
2.	<i>Artemisia absinthium</i>	Rainfall
3.	<i>Cucumis ficifolius</i>	Temperature
4.	<i>Doviyalis abyssinica</i>	Rainfall
5.	<i>Erythrina brucei</i>	Rainfall
6.	<i>Lagenaria siceraria</i>	Temperature
7.	<i>Rubus apetalus</i>	Rainfall
8.	<i>Steganotaenia araliaceae</i>	Rainfall
9.	<i>Veronina amygdalina</i>	Temperature
10.	<i>Withania somnifera</i>	Temperature

*Fig-2. Availability of Medicinal plants in Illuababor Zone and Bunobede Zone*

Management of Climate change

Population growth, urbanization and industrialization will result in a higher demand of renewable and non-renewable natural resources. Even though, currently there is a gap between availability (supply) and demand of increased population interests, there is a need to consider a more careful utilization of natural resources. Activities of filling the gap must be by reducing emission and protecting the coming generation, and make them beneficial. As climate change have contrasting effect in different part of the world, it mainly affect the developing world, causing variability in precipitation, solar radiation,

temperature, [CO₂] humidity etc, it leads to increased infestation of disease, insect, pest and dispersal of weed, which may affect food production and productivity. When the ambient factors affecting growth will become beyond the tolerance of the plant species, it will have a negative effect on their reproduction, life cycle and eventually extinct of the species from natural ecosystem. There has to be great consideration of increasing environmental benefits from forest ecosystem by afforestation, reforestation, for carbon sequestration, and storage of carbon as a biomass. Moreover, forest ecosystem can serve as a home or habitat for living organisms. Finally, it is crucial to use

different effective conservation strategies to maintain species, genetic diversity, and ecosystem services, and to proceed with research on different plant species to investigate their response to climate variability, and to identify which species will be most restricted in range and which will be most endangered and how they can be protected from extinction.

DISCUSSION

Medicinal plants in other continents have also been impacted by severe weather conditions. Africa's Sahel region experienced one of the most severe droughts of the 20th century. In Africa, medicinal plants of the Sahel include hibiscus (*Hibiscus sabdariffa*, Malvaceae), myrrh (*Commiphora africana*, Burseraceae), frankincense (*Boswellia* spp., Burseraceae), baobab (*Adansonia digitata*, Malvaceae), moringa (*Moringa oleifera*, Moringaceae), and various aloes (*Aloe* spp., Liliaceae). These were affected due to severe drought [12]. Future droughts due to climate change could have devastating effects on the region's already suffering ecosystems and harvesting capabilities [13].

Similarly, medicinal plants of the Mediterranean islands do not appear to be under any considerable threat from conditions of climate change [14]. The most wild collected MAPs, such as thyme (*Thymus* spp., Lamiaceae) and rosemary (*Rosmarinus* spp., Lamiaceae), are rather widespread and located at lower altitudes, making them less vulnerable to climate change than plants with narrower ecological requirements [15]. Rainforest ecosystems are also considered to be threatened by climate change. Climate modelling studies have indicated that these regions are likely to become warmer and drier, with a substantial decrease in precipitation over much of the Amazon [16].

CONCLUSION

There is noticeable change in temperature and rainfall pattern. Annual production of medicinal herbs shows both positive and negative trend when correlating with rainfall

and temperature trend. Majority of people were unaware about negative and positive effects of climate change on medicinal herbs. Untimely rainfall, increase/decrease temperature during unwanted time have negative impact on medicinal herbs production. It will be beneficial to understand the impacts of climate change on production of medicinal herbs. However, further research should be initiated to justify intensively.

ACKNOWLEDGEMENT

All the authors like to thank Mettu University for providing opportunity to undertake this study.

REFERENCES

1. IPCC, (2007). Summary for Policymakers. In: Climate Change 2007: Mitigation. Contribution of Working Group III to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change [B. Metz, O.R. Davidson, P.R. Bosch, R. Dave, L.A. Meyer (eds)], Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA.
2. Manisha Das, Vanita Jain and S K Malhotra (2016). Impact of climate change on medicinal and aromatic plants: Review. Indian Journal of Agricultural Sciences 86 (11): 1375–82.
3. WHO, (2001). Legal status of traditional medicine and complementary/alternative medicine: a worldwide review. WHO, Geneva.
4. Kalauni, Dharmendr, Joshi A (2018). Status of Medicinal and Aromatic Plant (MAPs) and Socio-Economic Influence. Acta Scientific Agriculture, 2(9 th September), 123-130.
5. Getachew Berhan, Shiferaw Dessie (2002). Medicinal plants in Bonga Forest and their uses. In: Biodiversity Newsletter. IBCR, Addis Ababa, 2:9-10.
6. Balemie K, Kelbessa E, Asfaw Z (2004). Indigenous medicinal utilization, management and threats in Fentale Area, Eastern Shewa, Ethiopia. Ethiopian Journal of Biological Science, 3(1):1-7.
7. Lulekal E, Kelbessa E, Bekele T, Yineger

- H (2008). An ethnobotanical study of medicinal plants in Manna Angetu District, southeastern Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 4:10.
8. Mesfin F, Demissew S, Teklehaymanot T (2009). An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. *Journal of Ethnobiology and Ethnomedicine*, 5:28.
 9. Muthuswamy R Solomon Mequanente (2009). Ethnomedicinal survey of folk drugs used in Bahir Dar Zuria district, Northwestern Ethiopia. *Indian Journal of Traditional Knowledge*, 2:281-284.
 10. Mirutse Giday, Zemedede Asfaw, Zerihun Woldu (2009). Medicinal plants of the Meinit ethnic group of Ethiopia: an Ethnobotany study. *J. Ethnopharmacol*, 124(3):513-521.
 11. Marius Keller. Climate Risks and Development Projects. Assessment Report for a Community-Level Project in Guduru, Oromiya, Ethiopia. 2009.
 12. Held I M, Delworth T L, Lu J, Findell K L and Knutson T R (2005). Simulation of Sahel drought in the 20th and 21st centuries. *PNAS*. 105(50): 17 891–6.
 13. Idso S B, Kimball B A, Pettit III G R, Garner L C, Pettit G R and Backhaus R A (2000). Effects of atmospheric CO₂ enrichment on the growth and development of *Hymenocallis littoralis* (Amaryllidaceae) and the concentration of several antineoplastic and antiviral constituents of its bulbs. *American Journal of Botany* 87: 769–73.
 14. Yoon C K. Warming moves plants up peaks, threatening extinction. *New York Times*. June 21, C4, 1994.
 15. Parmesan C and Yohe G (2003). A globally coherent fingerprint of climate change impacts across natural systems. *Nature* 421: 37–42.
 16. Neilson R P, Pitelka L F and Solomon A M, (2005). Forecasting regional to global plant migration in response to climate change. *Bio Science* 55(9): 749–59.

How to cite this article:

Raju. NJ, Manjoor Ahamad .S, Angala Parameshwari .S, Leta Deressa .T *Assessing the Impacts of Climatic Change Status of Medicinal Plants in Illuababor Zone and Bunobede Zone of South West Ethiopia* *Br J Bio Med Res*, Vol.05, Issue 04, Pg.1816 – 1821, July - August 2021. ISSN:2456-9739 Cross Ref DOI : <https://doi.org/10.24942/bjbmr.2021.868>

Source of Support: Nil

Conflict of Interest: None

Your next submission with [British BioMedicine Institute](#) will reach you the below assets

- Quality Editorial service
- Swift Peer Review
- E-prints Service
- Manuscript Podcast for convenient understanding
- Global attainment for your research
- Manuscript accessibility in different formats (Pdf, E-pub, Full Text)
- Unceasing customer service
- Immediate, unrestricted online access
- Global archiving of articles



Track the below URL for one-step submission

<https://bjbmr.org/manuscript-submission/>