Climate Change Impact on *Parthenium hysterophorus* growth-associated human health and agriculture risks in Asia in 2070

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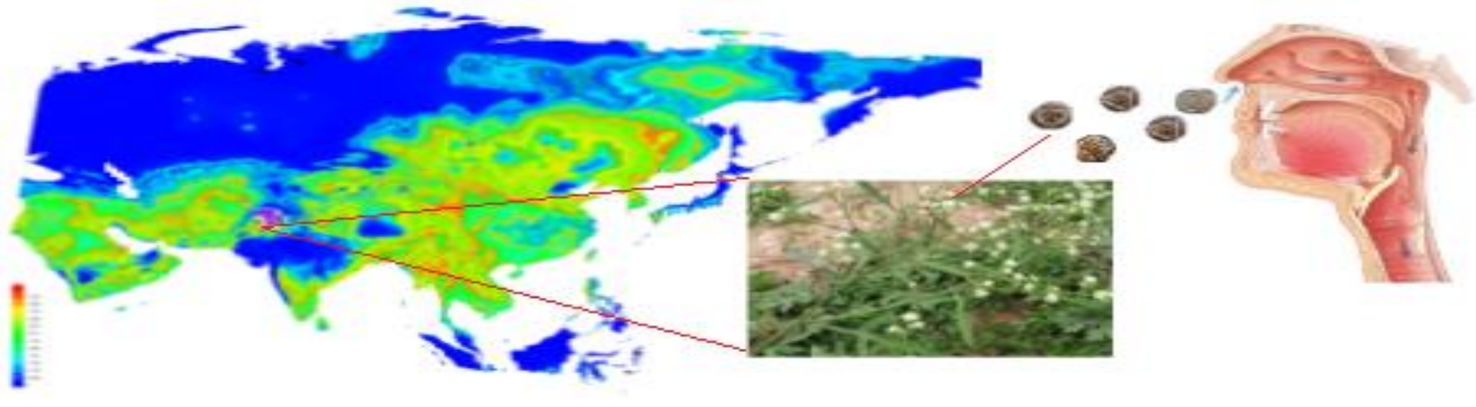
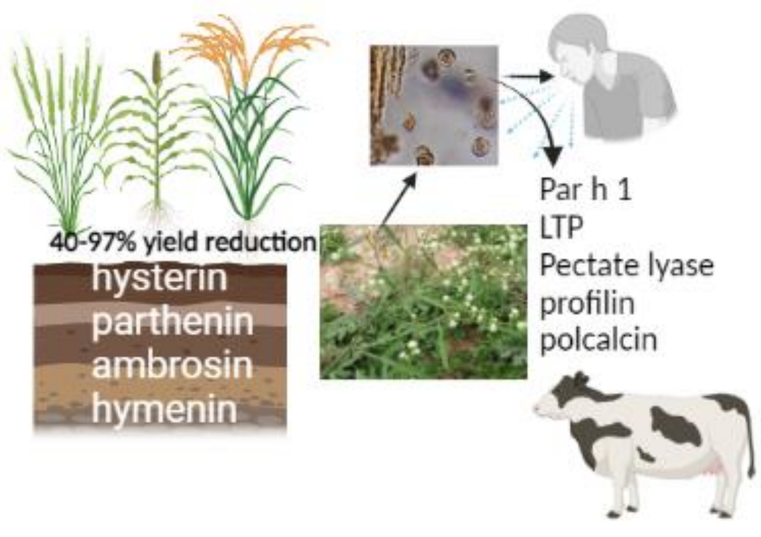


Introduction

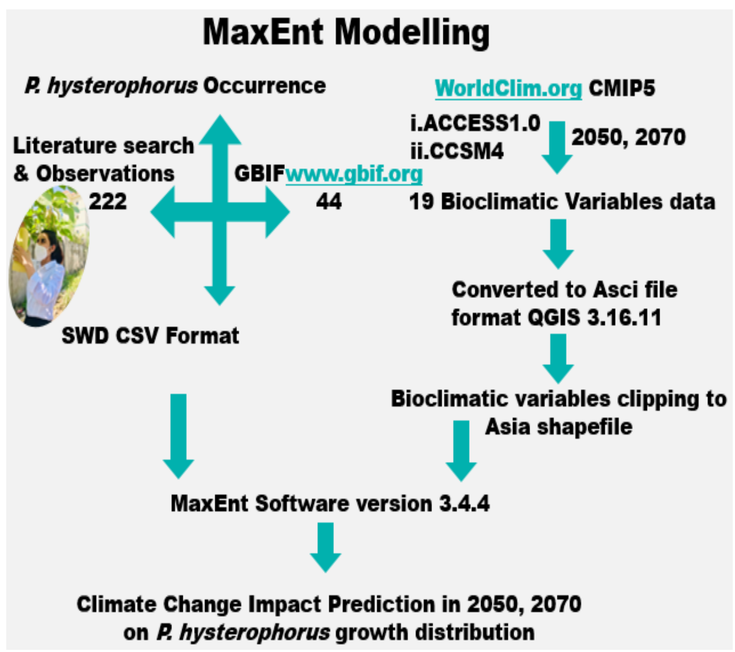
Parthenium hysterophorus is an invasive weed in Asia. It induces allergies in humans and affects agriculture production. The pollen contains Par h1, LTPs, profilin and polcalcin *that* cause contact dermatitis, hay fever, asthma, and bronchitis in humans. The plant contains hysterin, parthenin, ambrosin and hymenin that inhibit monocot and dicot plants germination and growth. The weed can invade further into new regions in future due to climate change, and challenges human health and agricultural crops production.

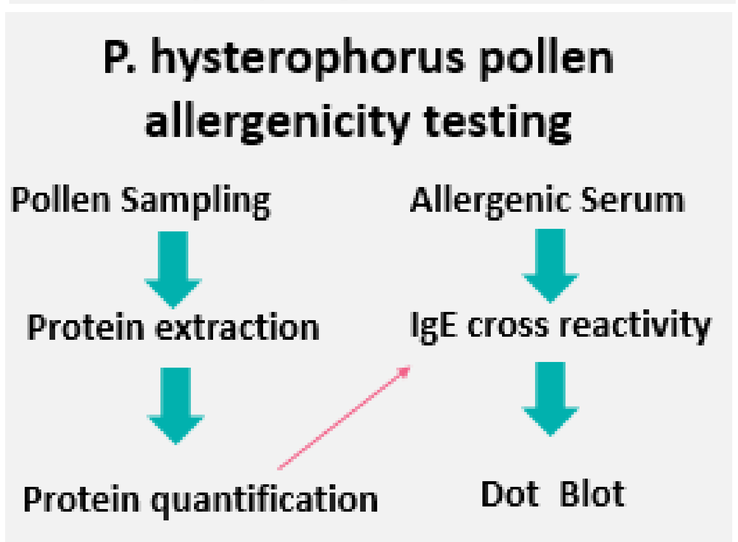
Biological impacts of *P. hysterophorus*



Methodology

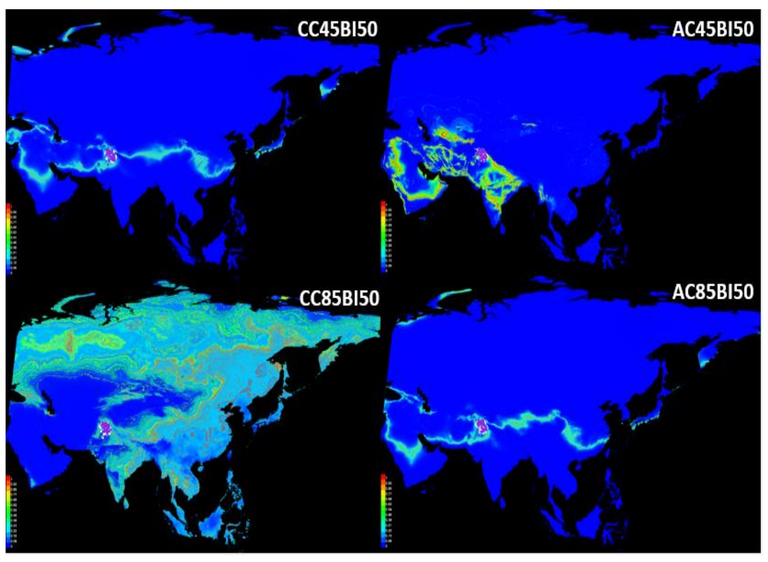
1. Predicting climate change through MaxEnt Model
2. Invasive weed species responsible for significant amount of pollen allergy in South Asia
3. Pollen collection – three cites
4. Extraction of proteins from pollen
5. Testing pollen protein extract for serum IgE binding





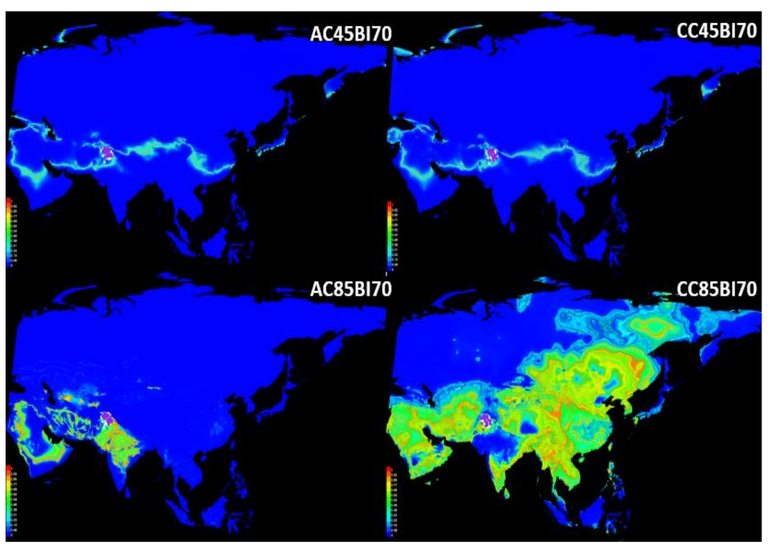
Prediction of changes: Increase is expected in global temperature in future according to RCP 4.5 and RCP 8.5 favouring *P. hysterophorus* invasion in new regions. The weed invasion can add to allergies in the region, and inhibit crop adversely affecting food production of the region.

2050 Invasion assessment AUC prediction with range of *Parthenium hysterophorus* predicted



The Colored scale from 0-1 on the bottom left of each map shows area suitability for the weed growth in 2050 under climate change scenario RCP 4.5 and RCP 8.5 according to the models Community Climate System Model (CCSM4) and Australian Community Climate and Earth-System Simulator (ACCESS1.0)

2070 Invasion assessment AUC prediction with range of *Parthenium hysterophorus* predicted



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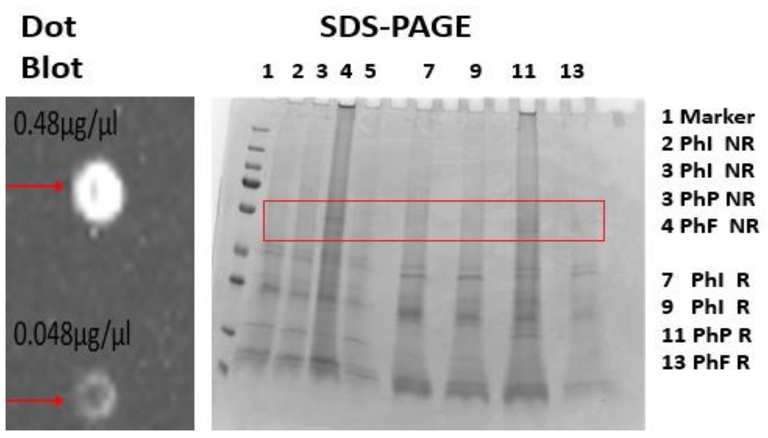

Dot Blot and SDS PAGE results of *P. hysterophorus* pollen extracts collected from different regions having different weather conditions in spring 2022

Par h1 is a known allergen of *P. hysterophorus*, and we have confirmed the weed pollen allergenicity through dot blot and western blot. The weed pollen extract was subject to cross reactivity with known allergenic serum and the cross reactivity of pollen extract with IgE in the serum was detected with HRP Anti IgE.

Discussion

According to RCP 4.5 and RCP 8.5 2.5 ºC and 4.5 ºC increase in global temperature is expected by 2070. This increase in global temperature will change weather patterns and land suitability for plant growth. Consequent to this shift, some areas will become less suitable for plant growth due to decrease in water availability and increase in temperature while other areas will become more suitable to plant growth due to increase in temperature and water availability. Change in the land suitability for *P. hysterophorus* growth modeling shows greater invasion of the weed in Asia. Invasion of the weed can inhibit agricultural crops growth due to its inhibitory characters. Invasion of the weed will produce greater quantities of pollens that will expose human population at greater risk of getting pollen allergies.

Conclusion

Future work to evaluate the impact of spreading this weed on human nasal allergy

Access 1.0 and CCSSM4 models, under RCP 4.5 and RCP 8.5 predict greater invasion of *P. hysterophorus in Asia* in the years 2050 and 2070. Increase in the weed growth can reduce agricultural productivity, and increase in *P. hysterophorus* based allergies. The study findings suggest coordinated efforts to control climate change. The findings also suggest to control weed growth through better weed management practices to enhance agricultural productivity, and control *P. hysterophorus* based allergies.

References

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Acknowledgement

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