



E-ISSN: 2320-7078
P-ISSN: 2349-6800
JEZS 2016; 4(1): 274-278
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Received: 25-11-2015
Accepted: 27-12-2015

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Assessing ethnomedicinal values and conservation status of Korai, *Berberis vulgaris* L (Berberidaceae) – A potential biopesticide in Usheri valley, Dir. Upper, Khyber Pakhtunkhwa, Pakistan

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Abstract

Speen Korai *Berberis vulgaris* L. (Berberidaceae) is one of the important medicinal and aromatic plant found in hilly areas of District Upper Dir. The aim of this study was to assess the ethnomedicinal value and conservation status of *B. vulgaris* in Usheri valley, upper Dir, Khyber Pakhtunkhwa, Pakistan. Questionnaires were developed for the purpose and data was collected from experienced old age residents. The analysis showed that majority (25%) of the people was using *B. vulgaris* for treatment of bone fractures followed by 15%, 15%, 7%, 6%, 5% and 3% for stomachic disease and wound healing, Jaundice, sour of mouth, Kidney stone, and intestinal diseases respectively. Use of *B. vulgaris* has also been reported for liver/spleen (1.5%), foot athletic (1%) and reducing sweet smell (0.5%). Furthermore, *B. vulgaris* has also been used for other traditional purposes (4%). The data obtained from farmers showed that (50%) respondents turned Berberis species, mainly responsible for the low yield of Wheat crop, while (40%) respondents claimed that flying insects supplement are responsible for the dispersal of wheat pathogens and ultimately maximizing the pathogen outbreak. It was concluded that traditional uses, serving as host for the pathogens, human population increase, uncontrolled grazing and agricultural land urbanization are the key factors responsible for the species vulnerability.

Keywords: *B. vulgaris*, Ethno medicinal use, Conservation status, Host pathogen ratio, Medicinal and Aromatic Plants, MAP.

1. Introduction

Among various Medicinal and Aromatic Plants (MAPs) species, *Berberis vulgaris* L. is one of the important species that gained special attention due to the presence of various organic acids and phenol compounds, i.e. Carotenoid pigments and Anthocyanin as well as Polyphenolase, anticholinergic, Phenolase, and Glycosidase enzymes. *B. vulgaris* is known to possess anti-histaminic, antioxidant and anti-inflammatory properties [1]. It is best antimicrobial, antiemetic, antipruritic, santipyretic, and has cholagogue actions. It has been used in curing many diseases like Leishmaniasis Cholelithiasis, Cholecystitis, Jaundice, Dysentery, gall stones and Malaria [2]. The presence of protoberberines and bisbenzyl-isoquinoline alkaloids (chondocurine, tetrandrine and berbamine) further enhances their effectiveness [3]. Their cold and dry nature strengthens liver, stomach and heart while the presence of Vitamin 'C' in its leaves Barberries has been found to treat Gastric Ulcer, Diarrhea, Edema, and Scurvy. Based on the majority of the medical properties of Barberries, it is related to the different alkaloids existing [4]. It kills infectious microorganisms [5].

Instead of adopting practices to conserve *B. vulgaris* effectively, the trend adopted by Farmers is much unfair and destructive. Wheat growing farmer conflict with Berberis is much common. It provides alternative hosting to those pathogens during winter season [6] who invades cereal crops and reduces productivity [7]. In European countries almost 46%, Rosaceae family were infected by rust fungi [8].

Infected Berberis produces pycnia, that have ordinary smell and releasing special nectar attracting insects [9, 10]. Insect consequent the spread of pathogens i.e *Puccinia graminis* and *Puccinia striiformis* [11]. "Pynica" is a cape like structure consisting special proteins that stimulate mating of pathogens. Flying insect might the salient, indirect agents that aggravate Berberis farmers, conflict and leading the Berberis more vulnerable to farmer threats. After the

observation of providing host to pathogens, different campaigns were started in different countries to eradicate *B. vulgaris* i.e. in USA [12]. Besides these factors their wide traditional uses, over exploitation and over harvesting, habitat degradation, commercial uses of their root were the most potent threats fueling its vulnerability [13, 14, 15]. IUCN therefore predicted that the availability of certain species is declining rapidly and if the decline ratio is not properly handled, then 4000 out of 10000 species will eventually reach into an endangered state at Global level [16, 17].

This study was conducted to assess the ethnomedicine value *B. vulgaris* its conservation status and finding responsible agents which leads the species towards extinct status.

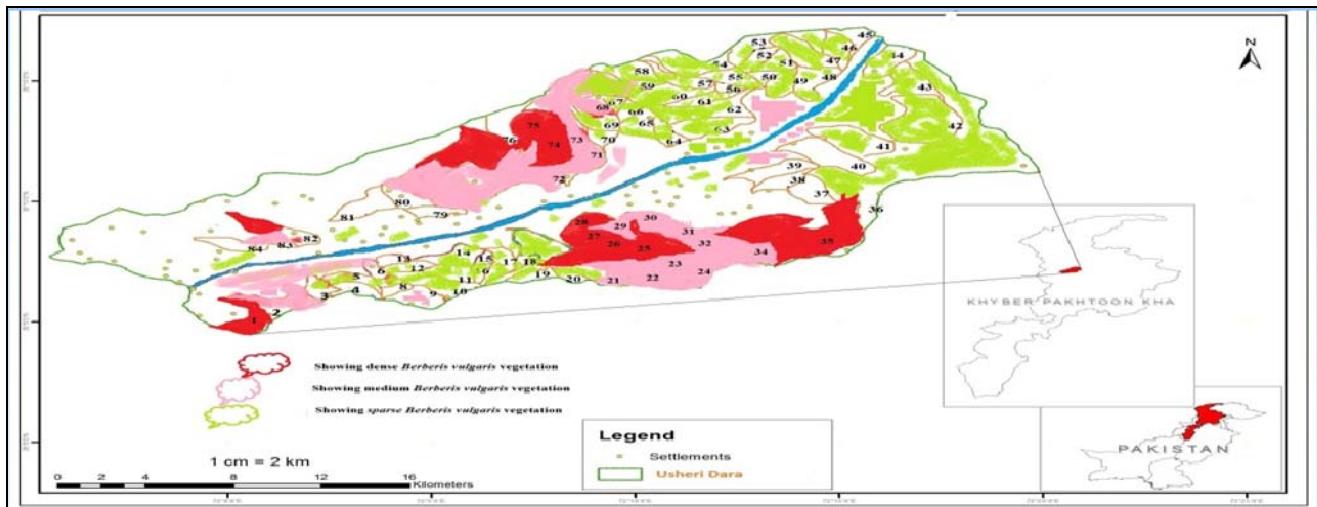


Fig 1: Base Map of Usheri Valley, Dir Upper, KP, Pakistan.

2.2 Identification of *B. vulgaris*

The collected specimen was identified with the help of available flora of Pakistan [19]

2.3 Data collection

To know about Ethnomedicinal uses, conservation status and the responsible reason of *Berberis vulgaris* extinction, a sample cross questionnaire format was designed to cover both direct and indirect factors responsible for species endangerment. Specific old age People were interviewed who were deemed to be highly knowledgeable in this regard [20]. Socioeconomic factors and the thematic questions were asked from 100 respondents to know about its sustainability and habitat change. Those farmers who were indirect in conflict with Berberis were mainly focused.

3. Results and Discussion

3.1 Ethnomedicinal Value

The analyzed data showed that majority (25%) of the people were using *B. vulgaris* for treatment of bone fractures followed by 15%, 15%, 7%, 6%, 5% and 3% for stomachic disease and wound healing, Jaundice, sour of mouth, Kidney stone, and intestinal diseases respectively. Uses of *B. vulgaris* has also been reported for liver/spleen (1.5%), foot athletic (1%) and reducing sweet smell (0.5%). Furthermore, *B. vulgaris* has also been used for other traditional purposes (4%) (Fig. 2).

Our results are supported by Naeef *et al.*, [21] and Bukhari *et al.*, [22] who found that *B. vulgaris* is used in China, USA, Europe and Japan for the treatment of similar diseases. Ghareeb *et al.*,

2. Material and Methods

2.1 Site Profile

The present study conducted during 2012-2013 in Usheri valley. It falls within district Dir upper situated at 72°-16' to 72°-50'E and 35°-06' to 35°-16'N. The valley is well forested and supports sub-tropical scrub, moist temperate and alpine type of forests. Most of the area is covered by thick, lush green vegetation with sever cold winter, pleasant spring season and moderate summer. The mean maximum and minimum temperature in the month of January has been recorded as 6.22 °C and -2.39 °C respectively [18].

[23] reported that *B. vulgaris* contain 62% berberine that might be the reason of their effectiveness against viral diseases. Due to the remoteness and rough topography in Usheri valley, the inhabitants were unable to access the modern health care facilities, especially most female population rely on medicinal plants and this can be the contributing factor towards its conservation dependency Khan *et al.*, [24]. According to a questionnaire survey of both male and female participants, females were found more inclined towards the uses of herbal medication. It has also been indicated by many local residents that Berberis is commonly known to have an adverse effect on sexual performance, however, no such type of adverse effect was reported by any researcher.

3.2 Conservation status of *B. vulgaris*

The Fig. 3 showed the actual and projected decline in conservation of *B. vulgaris*. The actual area of occupancy was 519.785 ha during 2012 and it was reduced to 500.71 ha during 2013. In supposition when this ratio of declination is projected onto ten years in the future, the decline in crown occupancy percentage will be around 4.08% in 2024. By observing through some important attributes of IUCN criterion such as reduction in area of occupancy, declining population, a reduction in the number of mature unit plants, poor regeneration, different stresses and the quality of the species were placed in the vulnerable category. The reduction of *B. vulgaris* occupancy is correlated to various reasons including farmer conflict, unsustainable and unscientific way of collection, free grazing, changing cultivation patterns and

harvesting for purposes other than medicinal use i.e. for fuel wood, fodder etc. Our findings are supported by Zhao *et al.*, [6] Bukhari [22] Chester [25] Marshall [26] Wellings [27] Jin [28] Agrios [29] and Roelfs *et al.*, [30] who investigated that unsustainable and unscientific way of collection, free grazing, changing cultivation patterns, harvesting for purposes other than medicinal use i.e. for fuel wood, fodder, Lacking a conservationist mind set, underestimation of its value, negative interventions of non-government organization (NGOs) and fluctuations in market demand, ill-conceived harvesting practices, improper management of NTFP department, depression in the economy, lacking cultivation practices and the absence of alternate sources to earn are the primary responsible factors for the decline in *B. vulgaris* and occupancy. Commercialization of *B. vulgaris* root further accelerates its vulnerability as a plant species Aumeeruddy-Thomas [15].

Fig. 4 shows that 50% respondents turned Berberis species, mainly responsible for the low yield of Wheat crop, while 40% respondents claimed that flying insects supplement are responsible for the dispersal of wheat pathogens and ultimately maximizing the pathogen outbreak. However, 10% respondents favored that, we have never observed that insect supplemented the dispersal for wheat pathogens. The above results coincide with the findings of Naef *et al.*, [21] Jin [28] Negi [11] who stated that the cereal crops present in the proximity of Bereris species were yielded low as compared to other crops, while, most of the farmers were found completely illiterate regarding the alternative host myth but eradicated Berberis species for the purposes of land expansion of agriculture crops. Besides its ethnomedicinal values, Leonard [9] reported this plant with attractive properties for various insects. This shows that *B. vulgaris* releases certain types of pheromones which are responsible for the attractiveness of insects.

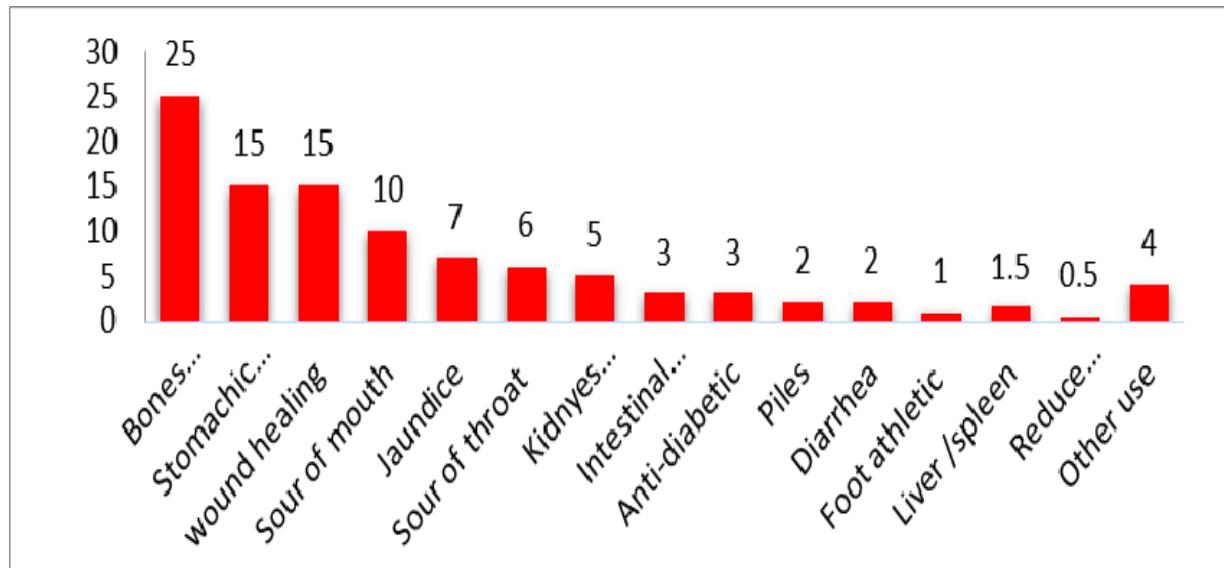


Fig 2: Ethnomedicinal uses of *B. vulgaris* L. in Usheri valley, Dir, K.P.

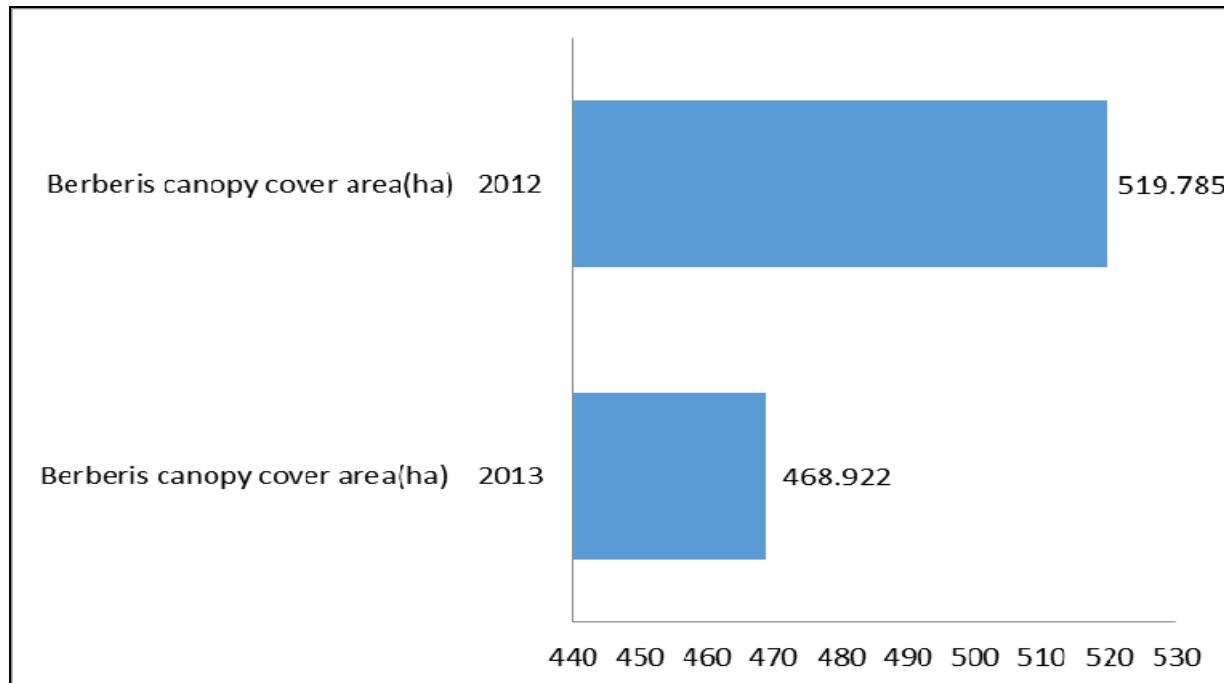


Fig 3: Data regarding 1 year Berberis canopy cover reduction in Usheri valley.

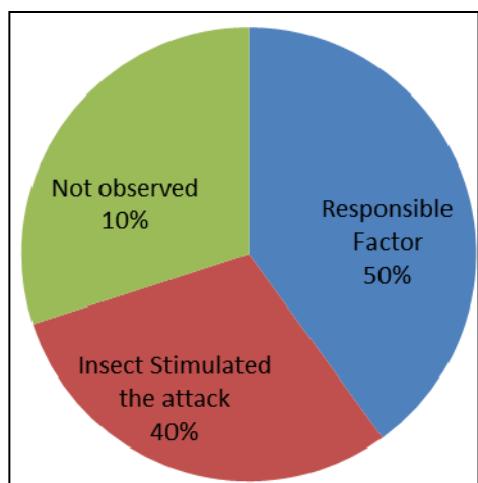


Fig 4: Showing the synergistic effect of *B. vulgaris* and Insects on Wheat crop.

4. Conclusion and Recommendations

B. vulgaris has been found with enormous ethnomedicinal properties. The plant has excellent value from the human perspective. But unfortunately, it is under severe threat due to the farmer's belief of serving as a harborage for pathogens of Wheat crop. Various researchers identified the role of *B. vulgaris* as an insect attractant^[31] due to the release of certain pheromones which needs to be further investigated. Due to the complex chemical composition, *B. vulgaris* be tested for its pesticidal action against various insects of economic importance. It is also recommended that the insects attracted to *B. vulgaris* be identified for their beneficial or injurial nature.

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