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Research Article

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Evaluated Aspect of Ethnobotanical of the Implementations the Fire-Resistant Forest Projects (YARDOP) in the Region Kepsut /Balıkesir (Turkey)

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Abstract Forest fires cause loss of lives besides financial damages affecting approximately 350 million hectares of area every year in the World. YARDOP (Forest Fire Resistant) forests were developed in order to prevent these fire damages. In this study, testing areas from the fire resistant plants in the region of Kepsut/Balıkesir (Turkey) to reduce forest fires were created. Great attention was paid on the used plants to have medical and economical values. Both the ethnobotanical and fire resistency features of the 21 taxa belonging to 11 families and used in experimental areas were identified.

Keywords Forest fires, ethnobotany, fire-resistant, YARDOP, Turkey

Introduction

Turkey indicates small continental characteristics in terms of biodiversity as it has agriculture, forest, mountain, steppe, wetland, coastal and marine ecosystems, and different forms and combinations of these ecosystems [1-4]. Turkey has a rich variety of mountainous and eco-geographical surface area of approximately 80 milion ha. In parallel to this ecological richness, its forests are also rich in species and composition. According to the findings made in 2012, the forests cover 27.6 % of the country's surface area [5].

For humankind, forest is a natural source morally and materially presenting economical, ecological, social and cultural benefits of such things as food, firewood, shelter, clean air and water, medicine, source of income, rest, landscape. Our forests are under the effect of biotic and abiotic factors. These are forest fires, pests and illnesses, illegal interferences (opening, settlement, occupation, exploitation, herding), lightning, storm, landslide, sun-tanning etc. can be classified as abiotic dangers. Among these factors the most damaging threat to our forests may be forest fires [6].

The most important activities in frame of fire prevention in Turkey are the applications of YARDOP (Rehabilitation of Burnt Forest Areas and Establishment of Fire Resistant Forests Project). In our country, YARDOP projects have been developed in various regions to prevent forest fires for the last 5 years [7-11].

Fitzgerald and Detweiler [12]; worked on the plants which can be planted in yards, are fire resistant, at the same time showy and have Medicinal value in order to reduce the risks of burning of the houses built in forested lands in case of possible forest fires. They classified these fire resistant plants into 3 groups as groundcovers, shrubs and trees. In another study, Romme et al. [13] investigated the resistance of herbaceous and woody plants in La Plata region locating in Colorado state of the USA against fires and they made these plants' fire damage evaluations and carried out mapping of this.

In this study, experimental areas from the fire retardant plants were created to provide forested lands to be responded quickly in case of possible fires and the plants planted in these areas were preferred to have Medicinal and

economical value. So, the planted plants were aimed to bring on a going-forward basis side income for the people living in countryside.

Materials and Methods

General Features of Research Area

Research area locates at 39° 31' 28'' - 39° 47' 28'' northern latitudes and 28° 03' 29'' - 28° 23' 42'' eastern longitudes in Kepsut district which is 29 km away from the province of Balıkesir. At the same time, the area is 32,5 away from Susurluk district and as for Dursunbey district it is 51 km away. The study was carried out on burnt and unburnt fields of Yılanlı Mountain and Boztepe.The general location of research area was presented in figure 1 [14].

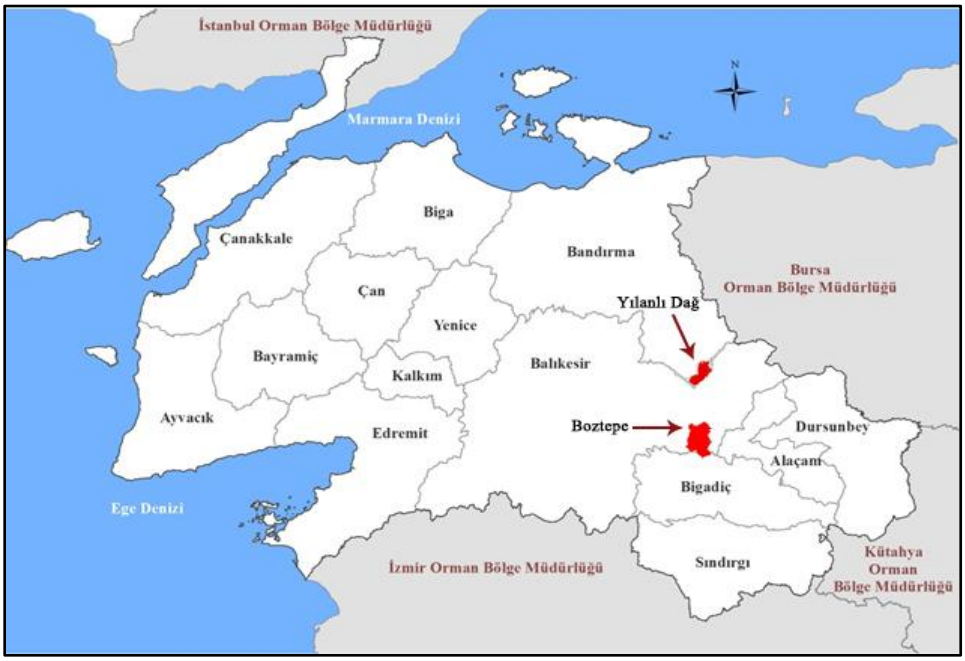

Figure 1: Map showing experimental areas (Boztepe and Mountain Yılanlı) (demonstrated with arrows)

Obtaining the species and their identification

21 plant species which are adaptable to the climate of the region and fire-resistant were determined. The list of the planted species and the place obtained were demonstrated in table 2. Plants species were obtained from Forest Nursery Directorates and Forest Sub-district Directorates. The species which were obtained for YARDOP experimental areas, their seedling and nursery numbers and the nurseries obtained were presented in table 2. In the blooming period,samples from the plants, which are adaptable to environment,were taken and Works of Davis [15] were made use of thereby these plants' identificatons were done.

Table 2: Plant species planted in experimental areas and the directorates/nurseries

Life forms	Family	Scientific name	Vernacular names	Place obtained
Herbaceous	Lamiaceae	*Salviavirgata* Jacq.	Fatmana otu	Denizli Forest Nursery Directorate
Herbaceous	Lamiaceae	*Origanum onites* L.	Bilyalı kekik	Torbalı Forest Nursery Directorate
Shrub	Lamiaceae	*Lavandula angustifolia* Mill.	Lavanta	Manisa Forest Nursery Directorate
Shrub	Lamiaceae	*Rosmarinus officinalis* L.	Biberiye	BalıkesirForest Nursery Directorate
Shrub	Ericaceae	*Erica arborea* L.	Funda	Çataldağ Forest Sub-District Directorate
Shrub	Fabaceae	*Spartium junceum* L.	Katır tırnağı	Torbalı Forest Nursery Directorate
Shrub	Anacardiaceae	*Rhus coriaria* L.	Sumak	BalıkesirForest Nursery Directorate

Shrub	Apocynaceae	*Nerium oleander* L.	Zakkum	BalıkesirForest Nursery Directorate
Shrub	Rosaceae	*Pyracantha coccinea* M. Roem	Ateşdikeni	Ezine Forest Nursery Directorate
Shrub	Ericaceae	*Arbutusunedo* L.	Kocayemiş	Muğla Forest Nursery Directorate
Tree	Fabaceae	*Cercis siliquastrum* L.	Erguvan	BalıkesirForest Nursery Directorate
Tree	Meliaceae	*Melia azedarach* L.	Tesbih ağacı	BalıkesirForest Nursery Directorate
Tree	Elaeagnaceae	*Elaeagnus angustifolia* L.	İğde	BalıkesirForest Nursery Directorate
Tree	Moraceae	*Ficuscarica* L.	İncir	Ezine Forest Nursery Directorate
Tree	Moraceae	*Morus alba* L.	Ak dut	BalıkesirForest Nursery Directorate
Tree	Rosaceae	*Amygdalus communis* L.	Badem	Ezine Forest Nursery Directorate
Tree	Rosaceae	*Pyrus elaeagnifolia* Pall.	Ahlat	BalıkesirForest Nursery Directorate
Tree	Fabaceae	*Robinia pseudoacacia* L.	Yalancı akasya	DursunbeyForestNursery Directorate
Tree	Sapindaceae	*Acernegundo* L.	İsfendan	Balıkesir Forest Nursery Directorate
Tree	Sapindaceae	*Acerplatanoides* L.	Çınar akçaağacı	Balıkesir Forest Nursery Directorate
Tree	Cupressaceae	*Cupressus sempervirens* L.	Servi	Balıkesir Forest Nursery Directorate

Results and Discussion

21 species adaptable to the region's climate and ecology were planted successfully in experimentalareas and adaptation to the area was provided. The species' field views were demonstrated in figure 2.

When the plants planted in experimentalareas were discussed according to their life forms, % 10 of them were comprised of herbaceous, %38 of them comprised of shrubs and %52 of them were comprised of trees.(Figure 3)

With this study, by planting fire-resistant plants which will financially contribute to the people living especially in the forest and at the edge of the forest, both an important barrier that is fire-retarding and reduces the speed of the fire will be provided and an important means of living has been created. In our research area, there are 16 neighboring villages to experimentalareas. Means of living of the people living in these villages is provided by agriculture and livestock as for some villages it is provided by beekeeping.

Approximately %71 of the species planted in experimentalareas are known to be an important bee plant. (Table 3). From these species *Arbutus unedo* L., *Erica arborea* L., *Pyrus elaeagnifolia* Pall., *Robinia pseudoacacia* L., *Rosmarinus officinalis* L. are dominant in terms of nectar and they are the bee plants which bees settle the most to get nectar [16,17]. These plants show perfect match for these experimentalareas.

Herbaceous –shrubby species of bee plants are comprised of species which are less fire-resistant compared to woody ones. The most fire-resistant shrubby plant is *Erica arborea*. As for woody species they are *Morus alba* and *Ficus carica* whose water content is high. As *Cupressus sempervirens*reduces the wind speed it is one of the bee plants that has indirect retarding contribution to fire . The fire-resistant characteristics of the plants planted in experimental areas are because of that their moisture contents are much, they have flexible structures and their litter contents are very few. (Table 4).

Dimitrakopoulos & Kyriakos [18] classified the plants which they discussed in their studies as low flammables, moderate flammables, flammables, easily flammables according to their resistency level against fires. Compared to the plants which we planted in experimentalareas, while Dimitrakopoulos and Kyriakos included species of *Nerium oleander* in a group of low flammables; as for *Cupressus sempervirens*, *Erica arborea* and *Arbutus unedo* they included them in the group of flammables. However, in his study, Neyişci [19] mentioned that the species of *Cupressus sempervirens* is one of the fire-resistant plants once it had started to burst into flames at 750 ^{o}C about within 5 seconds. Bilgili and Coşkuner [7] stated that the species of *Cupressus sempervirens* prevented air stream due to its ramification pattern and so it reduces the speed and routing of the fire.

According to the data obtained from the ethnobotanical studies carried out in the West of Turkey, it was discovered that 21 species have ethnobotanical use [20-26]. These species' ethnobotanical uses were presented in table 4.

Figure 2: Sowing views of the plants planted in experimental areas: 1. Salviavirgata, 2. Origanum onites, 3. Lavandula angustifolia, 4. Rosmarinus officinalis, 5. Erica arborea, 6. Spartium junceum, 7. Rhus coriaria, 8. Nerium oleander , 9. Pyracantha coccinea, 10. Arbutusunedo, 11. Cercis siliquastrum, 12. Melia azedarach, 13. Elaeagnus angustifolia, 14. Ficuscarica, 15. Morus alba, 16. Amygdalus communis, 17. Pyrus elaeagnifolia, 18. Robinia pseudoacacia, 19. Acernegundo, 20. Acerplatanoides, 21. Cupressus sempervirens.

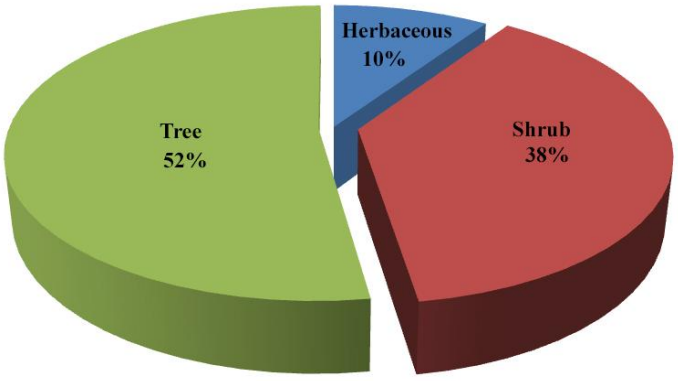

Figure 3: Percentage distributions of the plants Planted in experimental areas according to their life forms

Table 3: Blooming period, pollen and nectar capacities of the honey plants planted in experimental areas [17].

Scientific name	Vernacular name	Flowers time	Pollen production potential	Nectar production potential
Acer negundo L.	Dişbudak leaved akçaağaç	Mar-April	Secondary	Minor
A. platanoides L.	Çınar leaved Akçaağaç	Mar-May	Secondary	Minor
Arbutus unedo L.	Koca Yemiş	Mar-May	Secondary	Dominant
Cercis siliquastrum L.	Erguvan	April-May	Trace amount	Trace amount
Cupressus sempervirens L.	Servi	May-June	Trace amount	Doesn't exist
Elaeagnus angustifolia L.	İğde	April-June	Trace amount	Minor
Erica arborea L.	Funda	March-July	Dominant	Dominant
Morus alba L.	Dut	May	Trace amount	Doesn't exist
Origanum onites L.	Taş kekiği	May-Oct	Trace amount	Minor
Amygdalus communis L.	Badem	Jan-Mar	Minor	Minor
Pyracantha coccinea M. Roem	Ateş dikeni	April-June	Secondary	Trace amount
Pyrus elaeagnifolia Pall.	Ahlat	April-May	Secondary	Dominant
Robinia pseudoacacia L.	Yalancı Akasya	April-June	Trace amount	Dominant
Rosmarinus officinalis L.	Biberiye	Feb-May	Minor	Dominant
Salviavirgata Jacq.	Adaçayı	May-Aug	Trace amount	Secondary

Table 4: The resistance mechanism and ethnobotanical uses of the plants planted in experimentalareas

Scientific name	Resistence characteristics against fire	Part of uses	Ethnobotanical uses
Salviavirgata Jacq.	Much water content Flexible leaves Little litter content	Aerial parts (flowers, leaves)	Medicinal use : Cold, hemoroid, hearth conditions, tranquiliser, wind expectorant [23] Economical use: Bee plant, animal feed, spice [17]
Origanum onites L.	Much water content Flexible leaves Too little litter content	Aerial parts (flowers, leaves)	Medicinal use: Pain reliever, cholesterol, diabetes, balancing blood pressure [20,21,24] Economical use: Spice [24]
Lavandula angustifolia Mill.	Much water content Flexible leaves Little litter content Bushy and reducing fire speed	Aerial parts (flowers, leaves)	Medicinal use: Colic and pain killer, anti-inflammatory, migraine, acne [22,25] Economical use: Bee plant, Spice, Perfumery,Ornament 17, 23]
Rosmarinus officinalis L.	Much water content Flexible leaves Little litter content Bushy and reducing fire speed	Aerial parts (leaves)	Medicinal use: Cold , wind expectorant, diuretic, diabetes [21-26] Economical use: Bee plant, Spice, Perfumery,ornament [17,21,22]
Erica arborea L.	SiO_2 compound in its roots	Roots	Medicinal use: Shortness of breath, blood pressure, galactagogue [25] Economical use: Bee plant, Ornament [17]

			Other uses: As brooms, pipe, firewood [25]
Spartium junceum L.	Low flammable volume Too little litter content	Aerial parts (young shoot)	Medicinal use : Not yet known [23, 25] Economical use: Bee plant, ornament [17,23] Other uses: As brooms [23,25]
Rhus coriaria L.	High moustire content of its stem and branches	Aerial parts (fruits)	Medicinal use: Periodontal diseases [23,25] Economical use: Tannery, Spice [23,25] Other uses: Natural dyeing [23,25]
Nerium oleander L.	Much water content Deep root system Strong adventive characteristics of shooting	The whole plants	Medicinal use: Rheumatism, Hemoroid, Eczema, carbuncle (Used externally) [23,25,26] Economical use: Orrnamental plant [23,26] Warning: Extremely poisonous.No internal use [23,25]
Pyracantha coccinea M. Roem	Fire speed reducing as hedge plant	The whole plants	Medicinal use : Unknown Economical use: Ornamental plant, hedge plant, bee plant [17]
Arbutusunedo L.	High water content	Aerial parts (fruits, branch, leaves)	Medicinal use: As food (fruits) [23,25] Economical use: Ornamental Plant [23,25] Other uses: Firewood, animal feed, bee plant [23,25]
Cercis siliquastrum L.	High water content	The whole plants	Medicinal use: Unknown Economical use: Bee plant, ornamental plant [17] Other uses: Animal feed [23-25]
Melia azedarach L.	High water content	Aerial parts (fruit, seed)	Medicinal use : skin wounds, rheumatism [23] Economical use: Unknown Other uses: Insect repellent, bead [23]
Elaeagnus angustifolia L.	High water content	Aerial parts (leaves, seed)	Medicinal use: Diarrhea [23,25] Economical use: Food (fruits) [23] Other uses: Unknown
Ficuscarica L.	High water content	Aerial parts (leaves, fruit)	Medicinal use: Carbuncle, wart, Hemoroid, leg pain, eczema [20,23,25] Economical use: Food (fruits) [23] Other uses: Bread yeast and rennet[23]
Morus alba L.	High water content	Aerial parts	Medicinal use : anaemia, diabetes,

		(fruit, flowers)	aphta [23] Economical use: Food (fruits) [23] Other uses: Unknown
Amygdalus communis L.	High water content	Aerial parts (fruit, seed)	Medicinal use : Diabetes, wound healing, cough, headache, crack, skin rubbing [22-24] Economical use: Food (fruits) [22-24] Other uses: Unknown
Pyrus elaeagnifolia Pall.	High water content	Aerial parts (fruit, leaves)	Medicinal use: Diabetes, diarrhea [20,23] Economical use: Food (fruits) [20,23] Other uses: Vinegar, pickle [23]
Robinia pseudoacacia L.	High water content	The whole plant	Medicinal use: Unknown Economical use: Unknown Other uses: ornamental plant, hedge plant, bee plant [20,23,25]
Acernegundo L.	High water content	The whole plant	Medicinal use: Unknown Economical use: Unknown Other uses: ornamental plant , bee plant , building wood stuff (from wood) [19]
Acerplatanoides L.	High water content	The whole plant	Medicinal use: Unknown Economical use: Unknown Other uses: ornamental plant , bee plant [17]
Cupressus sempervirens L.	High water content : Having a sructure that prevents air move significantly between its leaf and branches	The whole plant (wood)	Medicinal use: Unknown Economical use: Firewood, timber , furniture (wood) [7] Other uses: Plough (on farms) [7]

Conclusion

There is a thinning zone application along the way in most of European countries including the USA and there is no application of stopping area planted with low flammable species in forestlands [27]. Such kind of stopping area is used only by the settlements as both landscaping and a basis of planting resistant against fires [28]. But in this study, fire stopping zones were created with the fire –resistant plant which will contribute to the economy of the region and its residents. So, protecting ecological balance and leaving more dense forest to future generations will be provided by making zones to reduce or stop possible fires available.

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