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RESEARCH ARTICLE

CLIMATE CHANGE EFFECT ON ENVIRONMENT IN LANDSCAPE AREAS NEAR KONYA, TURKEY

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ABSTRACT

Turkey oak (*Quercuscerris*) is one of the 18 oak species that spread naturally in Turkey. Turkey oaks have been found to be particularly sensitive to soil drought. The growth and the survival of oak juveniles are influenced by water availability. The goal of this study is to determine the drought and silvicultural effects on crown dieback, branch mortality and chancing biodiversity on the coppice forests of central Anatolia in Turkey. Crown dieback or branch mortality, expressed as the percentage of dead above ground biomass (stems, branches and leaves), was used as a measure of tree vitality. The pattern of branch mortality distribution was recorded in different vertical parts of the crown. A systematic sampling design will chose for this study. All type of woody vegetation will record for all sampling plots.All the statistical analyses will perform using the statistic program SPSS and PC-Ord V.6 Program,final choice of number of groups by means of the indicator species analysis.

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INTRODUCTION

In recent year's climatic change affected coppice forests. These effects are unclear and complex. Warmer temperatures might be expected to increase drought stress on trees but this oversimplifies the problem. Especially, warmer winter temperatures may play a role in supporting higher populations of forest (Binkley, 2010). Moreover, there has been a reduction in the water levels of the region. Thus, not only amount of coppice forests but also its species was changed. As well as new plants need to be introduced (from seed) to replace stumps those have lost their vigour after many coppicing cycles.Global average temperature has increasedby 0.8 ^{0}C since 1900 (Hansen *et al*., 2006). it is observed 12 hottest years Since 1880 (Schar and Jendritzky, 2004; Ciais *et al*., 2005). Latest climatechange scenario projections for Europe suggest that by 2100temperatures will increase between about 2 ^{0}C in Ireland and theUK, up to about 3 ^{0}C in central Europe and 4–5 ^{0}C in the northern Boreal and parts of the Mediterranean regions (Christensen *et al*., 2007). Especially, droughts have much more drastic consequences on tree growthand survival than gradual changes in average climate conditions (Fuhrer *et al*., 2006).

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Heat is often a stress factor in Mediterranean and Temperate Continental zone. Thus, at hightemperatures photorespiration is stimulated while photosynthesisis inhibited (Rennenberg *et al*., 2006). There are many published scientific papers about climate during the last decade. For example, the impacts of climate change on forest trees and ecosystemsin Europe (Saxe *et al*., 2001; Hamrick, 2004; Broadmeadow*et al*., 2005; Millar *et al*., 2007; Lindner *et al*., 2010) or climate change impactson forest productivity and management are numerous (Noss,2001; Boisvenue and Running, 2006; Kirilenko and Sedjo, 2007;Eggers *et al*., 2008). However, there is no survey of climate change impacts on differentaspects of forests focusing on central Anatolia in Turkey.

Turkey is home to more species of oak (*Quercus*) than any other single country in the western Palaearctic. Due to its enormous range in climate and geographic diversity the country contains very different phytogeographic regions (the Euro-Siberian, Irano-Turanian and Mediterranean). Oaks dominate woodlands and shrub lands in each of these, and in different altitudinal belts. Deciduous oak wood lands and shrub lands with *Q. pubescens* or *Q. cerris* as dominant trees, or frequently both of them co-occurring on central Anatolian in Turkey. Much rarer are *Q. petraea* subsp. *iberica*, *Q. ithaburensis* subsp. *macrolepis*, *Q. trojana*, *Castaneasativa* and *Ostryacarpinifolia*.

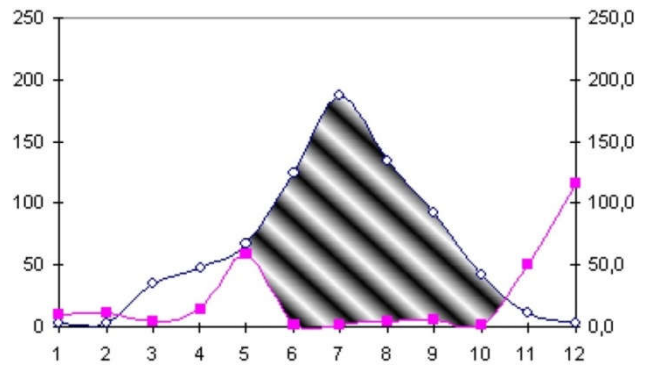

Figure 1. The relation between precipitation and potential evapotranspiration (----Precipitation, -----P. evapotranspiration)

The shrubs represent wide spread Eurasian or East Sub-Mediterranean species such as *Juniperusoxycedrus*, *Rosa canina* and *Rubuscanescens*, or belong to the Anatolian element such as *Berberiscrataegina* and *Coluteacilicica*, all fairly browsing-resistant due to armature or indumentum. The purpose of thispaper was to analyses how climate change especially drought effect may influence nature Oaks forests of Central Anatolia.

MATERIALS AND METHODS

In this study, it was selected 3 coppice forests of *Quercuscerris*, which have affected drought because of climate change. All coppice forests are in Gokyurt Village located near Konya city in Turkey. Precipitation and evapotranspiration rates of plots area are given figure 1. *Quercuscerris* L., commonly known as Turkey oak, is a large fast-growing deciduous tree species growing to 40m tall with a trunk up to 1.5-2m diameter, with a well-developed root system. It can live for around 120-150 years (De Rigo *et al*., 2016). The range of this species extends from southern Europe to Asia Minor (Fig 2). Crown dieback or branch mortality have been calculated, expressed as the percentage of dead above ground biomass (stems, branches and leaves), was used as a measure of tree vitality. The pattern of branch mortality distribution was been record in different vertical parts of the crown. Ground vegetation differences were determined among all coppice forests. All type of woody vegetation was recorded for all sampling plots. Data for morphological, growth parameters and climatic condition were collected of all sampling plots. A systematic sampling design was chosen for this study. It was chosen 3 replicated plot each coppice forests. Each plot has 10 x 10 m sized.

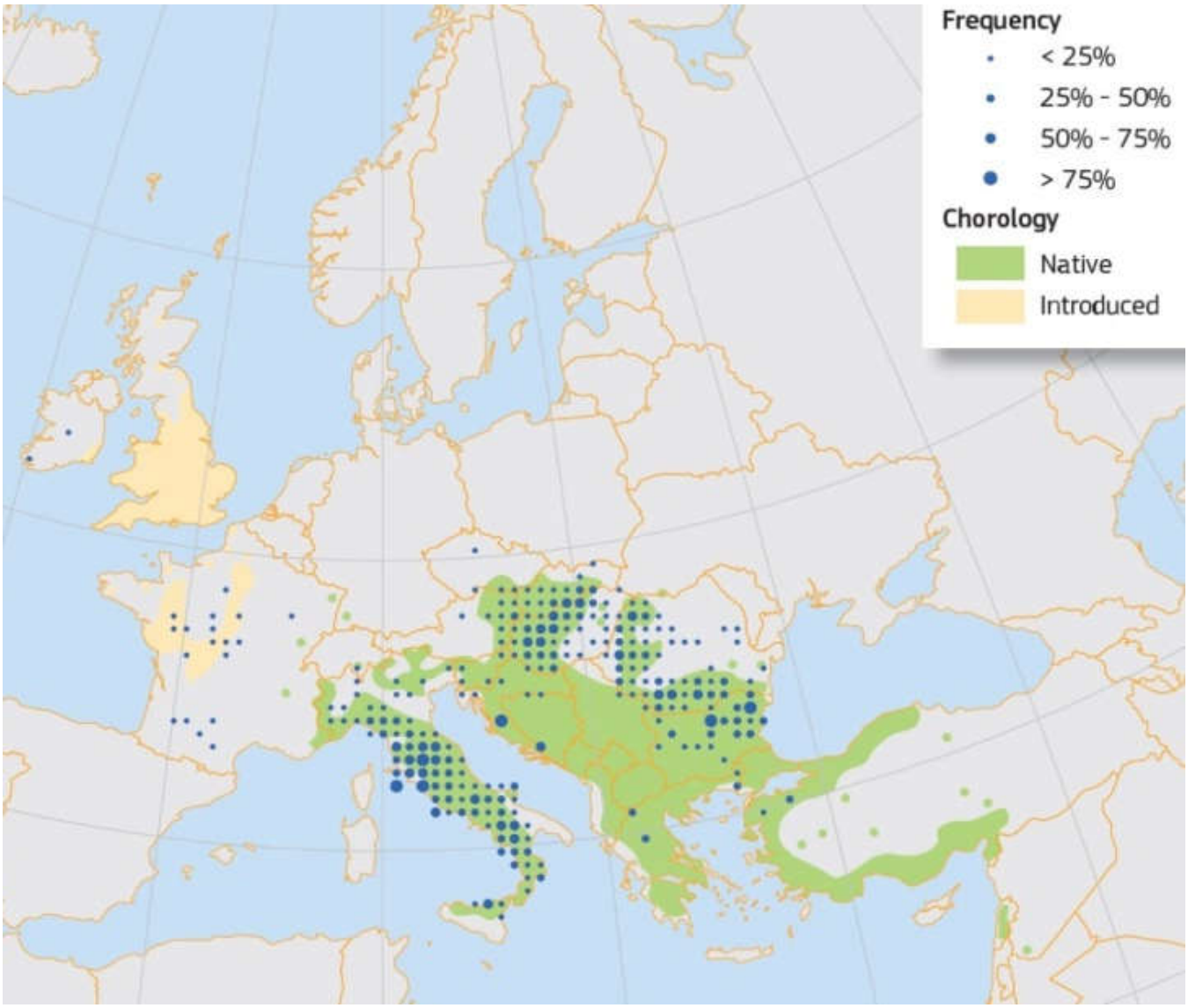

Figure 2. Nature or introduced distribution of *Ouecuscercis* L. (D. de Rigo *et al*., 2016)

Figure 3. Crown dieback and branch mortality in Turkish oaks

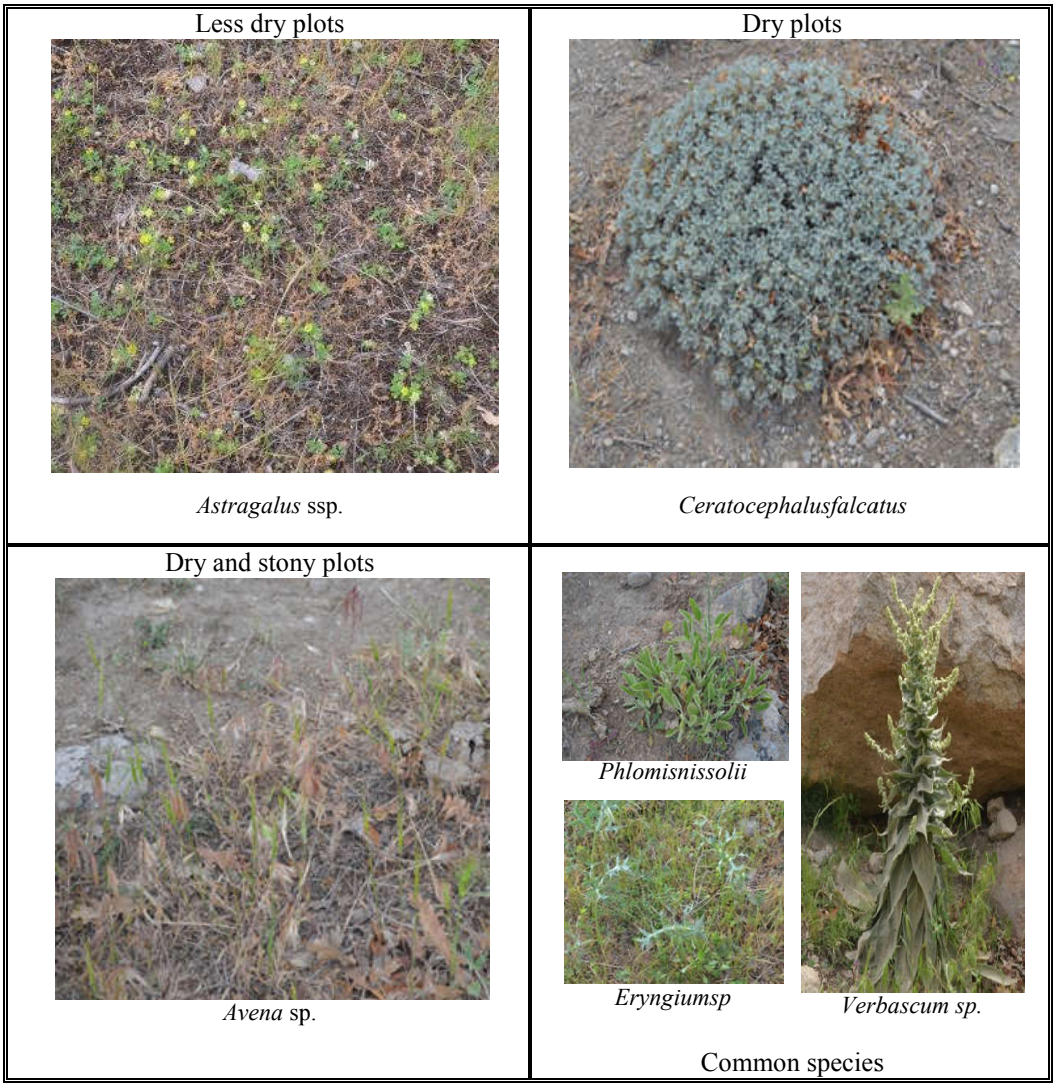

Figure 4. Indicator species determined by research areas

In total 9 sampling plots with vertical and horizontal distances of 25 m between each were determined. All the statistical analyses were performed using the statistic program SPSS 9.0 and PC-Ord V.6 Program.

RESULTS AND DISCUSSION

Generally Mediterranean sites are vulnerable to extreme weather events. So, such this extreme events may pose seriousthreats to environmental systems either because of the effect ofdrought episodes on vegetation stress (Trigo *et al*., 2002; Trigo *et al*., 2006; Garcia-Herrera *et al*., 2007; Gouveia *et al*., 2009). Especially, the effects of climate change as drought on trees, It is seen in crown dieback and branch mortality. For example, in Spain, *Pinusmugo* (subsp. *Uncinata*), *Pinuspinaster* (Soland., non-Ait.), and *Pinuspinea* L. dieback is occurring (Resco De Dios *et al*., 2007). By this comparison, with plots already adapted to the local climate conditions, it is able to find out the adaptation of plants, coming from central Anatolian regions, to stress climate conditions such as drought, as it is expected to occur more frequently in Turkey in next year's due to Climate Change. It was observed that the soil surface is dry and moderately stony places in less dry plot. This is particularly clay-silt loam soil types indicate the presence of drought caused. In the analysis of vegetation, *Astragalus* sp. has been identified as indicator species (Figure 4). Standard environment consists of low water supply, full sun, no shade, and well-drained sandy/loamy soil. The plant adheres to a perennial life cycle (living for more than two years) and is an evergreen retaining its leaves throughout all seasons. It was observed that deep soil and moderate rate stony in plots on the dry plots. Dead branches were seen all *Quercus* trees. According to the data supplied of plots, it was counted average 8 dead branches. In such areas, the effects of drought due to climate change are seen more often. In the analysis of vegetation, *Ceratocephalusfalcatus*has been identified as indicator species. This species grows depleted tussock grassland, sunny hillsides and scabbed communities of dry land basins. The dry and stony plots have high rate stony and soil surface was very dry. According to the data supplied of plots, it was counted average 6 dead branches. *Avena*sp.has been identified as indicator species according to vejetation analysis. The other comman species are *Phlomisnissolii, Eryngium* sp., *Verbascum* sp. Crown dieback or branch mortality was used as an indicator of tree vitality. A significant negative strong correlation between soil drought and tree vitality was found. Fewer plants were found in less dry plots than dry or dry/stony plots. Branch mortality rates or crown dieback was higher in dry plots compared to less dry or stony plots. Trees from the dry plots were much more affected by soil drought, showing lower vitality, than the trees from less dry plots. Branch mortality threshold was found 35%. Significant difference was found between height and length of the trees proving stunted growth. '2015 summer drought' had high impact on basal area increment. Particularly extreme dry year is resisting the growth and survival of oak. Soil drought together with extreme summer drought impedes the growth of oak trees in Konya forests.

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