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Research Article

EFFECT OF DEAD TREES ON SOIL PROPERTIES OF NATURAL POPULATIONS OF *POPULUS CASPICA* IN THE NORTHERN FORESTS OF IRAN

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ABSTRACT
Dead trees are the main components of soil preparation and the dynamics of forest ecosystems and they have an important role in improving the fertility of forest soils. For this purpose surrounding soil white pellet dead trees, were studied in a range area of 382.5 hectares of Safrabasteh forests of northern Iran. In this study, strip transect width of 10 m was used and were examined all dead trees white pellets. According to the decay rate, each dead tree were placed in four different classes of dead trees as new, begin ,advanced and complete of decay. Beside with each dead tree,3soil samples from depths of 0 to 20 cm(the distances below 0.5 m and 1 m dead trees) harvested and were transferred to the laboratory. In this study,soil physical properties including soil texture,true specific gravity and soil bulk density,porosity and saturated soil moisture were studied. The results of this study showed that there is no significant difference between different degrees of decay in different distances and factors like saturation percentage,in 95% confidence difference. But there are significantly difference true density of soil between different degrees of decay in a distance of one meter and apparent specific weights and soil porosity between different degrees of decay in 95% confidence difference. But, there was no significant difference at 95%soil apparent specific weights and soil porosity at zero, and half a meter on dead trees.

Key Words: *Dead Tree, Soil Properties, Populus caspica, Northern Forests of Iran*

INTRODUCTION
Dead trees are dry trees standing or disabled in jungle that they arise usually in pristine forests in effect of aging trees and or environmental stresses and caused dynamics of forest ecosystems (Lowis, 1998). Dead trees what the dry trees standing and either trees or wood materials fall on the ground as are known as one of the sources of ecosystem dynamics (Mark *et al.,* 2006). Functions such reconstruction of food in the forest (Mccomb and Lindenmayer, 1999) helped energy flow and cycling of nitrogen and carbon releases (Harmon *et al.,* 1986) are other features of the dead trees. Dead trees with larger volumes are supported from for many species, especially invertebrates and fungi that in capable of making their own materials (Swift, 1979; Kleinvos, 1996; Nilsson, 1997; Rydin, 1997; Sippola, 1999). Dead trees act as one of the most important forest reserves that slowly released during the decomposition (Krankina *et al.,* 1999; Laiho and Prescott, 1999). Dead trees are as key habitat for many species. For example, invertebrates, fungi, lichens, birds and mammals are dependent to dead trees and they use the more as a source of food or shelter (Siitonen, 2001; Esseen *et al.,* 1997; Ferris-Kaan *et al.,* 1993). Dead trees impact on microclimate of forest and act as a source of water supply during periods of drought (Maser and Trappe, 1984; Harmon *et al.,* 1986). In addition, they are as long-term food storage (Keenan *et al.,* 1993) and carbon content add to significantly in global stock of carbon in ecosystem (Harmon *et al.,* 1986). Dead trees provide natural mixture of a structural relationship with its prior mass in some communities (Hansen *et al.,* 1991).The number of dead trees in a forest ecosystem is highly dependent on forest management (Oakland, 1994; Guby and Dobbertin, 1996; Green and Peterken, 1997). Standing dead trees are greater habitat for birds and fallen dead trees are habitat to refuge for organisms such as fungi and plants. Finally, after falling into a dry tree and long-term decay process,increased soil carbon and nitrogen storage. Usually after drying, as some trees remain standing that has depends on several factors including type of

species,environmental conditions and type of land such as percent slope. It is possible tree remains standing after the drying time of the beginning without having been seen as dead tree. According to land owners on the importance of forest ecosystems and positive role in increasing and conservation of biodiversity,this study examines available status of dead trees (*Populous Caspica*) in forest stands in northern Iran and their effects on some soil physical properties will studied.

MATERIALS AND METHODS

The studied area this research was performed in forests Guilan province Safrabasteh in eastern part forests of northern Iran. According to the UTM system this jungle is between during the "00 ° 49 '59 and the" 30 and '59 and longitude ° 49 'and 00 ° 37 to '21' and '27 and 30 ° 37 (Figure 1). Minimum its height 23 m and its maximum is 17 meters from the sea. Its general slope towards the north to northeast and the topography is relatively flat. The fourth geological belonging to the (Quaternary) and muddy plains are covered. Soil was Hydromoorf and made of sand and sand-clay, sometimes with great depth.The average annual rainfall is 1228.5 mm and the minimum and maximum temperatures were 10 and 35 degrees Celsius, respectively. This region has a humid climate with cold winters.Vegetation has forest communities such as Alnetum, Populetum and Ptericaryo - Alnetum. In order to effect of dead trees on the soil the studied areas trip transect width of 10 m was used. All white pellets of dead trees along the identification and grouping in one of the four classes new began to decay, advanced decay and complete decay in terms of decay (Zolfaghari, 2007; Aakala, 2008). Then Soil around dead trees were sampled under three sections,distance of half a meter and within a meter of dead tree to zero at a depth of 20 cm (Spears and Lajthah, 2004). In this study,soil physical properties including soil texture, correct density of and soil apparent specific weights,porosity and saturated soil moisture were studied. After data collection were investigated their normally using Kolmogorov – Smirnov test and then were analyzed using one-way analysis of variance. The mean treatment also DMRT was used.

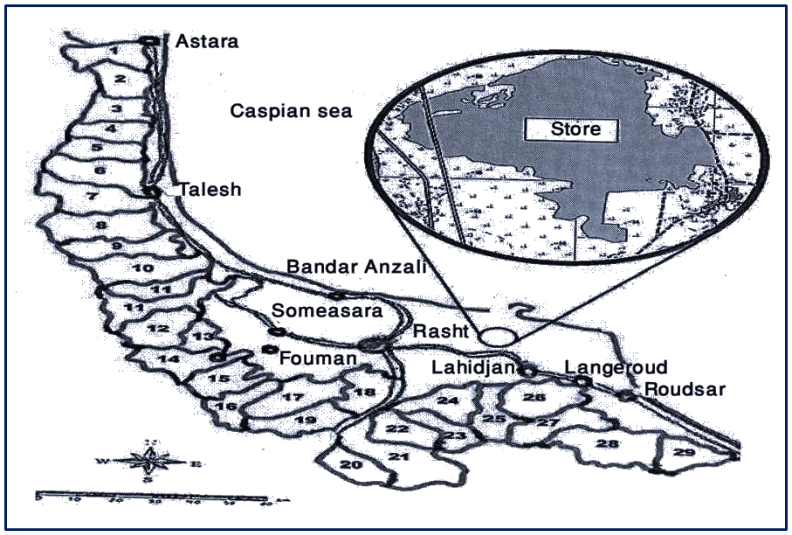

Figure 1: The map of study area

RESULTS AND DISCUSSION

The results of this study showed that there is no significant difference at 95% confidence level between varying degrees of decay,and soil moisture saturation. But in the true density and bulk density and soil porosity there are significant difference at 95% (Table 1 and 2). Also, analysis of variance in different distances from four dead trees decay class in the study areas hows that there are significant difference in

95% confidence level between fresh soil under dead trees and in the beginning stages of decay with soil under dead trees with advanced decay and full (Table 3).

Table 1: ANOVA results of at various degrees of soil erosion of study area

Type of dead trees	sp(%)	Percent of Porosity	g/cm^3=b.d	g/cm^3=p.d
Newly dead trees	(88.57)^{a}	(50.99)^{a}	(1.12)^{a}	(2.28)^{ab}
Begin decay	(81.33)^{a}	(49.81)^{a}	(1.18)^{bc}	(2.35)^{a}
Advanced decay	(84.27)^{a}	(42.94)^{b}	(1.28)^{a}	(2.25)^{ab}
Complete decay	(85.34)^{a}	(44.65)^{b}	(1.21)^{ab}	(2.19)^{b}
F	0.225^{ns}	0.002*	0.006*	0.024*

^{ns}*: non-significant*
**: significant level at 5%*

Table 2: Analysis of variance physical characteristics and soil texture in the study area according to different distances from dead trees

Different distances (m)	sp(%)	Percent of Porosity	g/cm^3=b.d	g/cm^3=p.d
Zero	(84.29)^{a}	(47.24)^{a}	(1.20)^{a}	(2.27)^{a}
Half	(84.54)^{a}	(47.39)^{a}	(1.20)^{a}	(2.29)^{a}
One	(85.8)^{a}	(46.66)^{a}	(1.20)^{a}	(2.25)^{a}
F	0.687$^{n.s}$	0.998 $^{n.s}$	0.995$^{n.s}$	0.687$^{n.s}$

^{ns}*: non-significant*

Also Figure 2 shows that in degree 2 of dead tree have maximum and degree 4 of dead tree have minimum true specific gravity respectively. According to Duncan test there is significant difference between two and four degrees of dead trees other degrees of dead trees from the true specific gravity. In terms of bulk density of the and according to white pellets dead trees in the study area there are significant differences between dead trees degree three and one and degree one and four and three and two degrees (Figure 3).

Table 3: Analysis of variance at different distances four classes of decay of dead trees in the study area

g/cm^3=p.d various distance (m)			
class of decay	one	half	^{zir0}
Newly dead trees	(2.20)^{b}	(2.28)^{a}	(2.37)^{a}
Begin decay	(2.36)^{b}	(2.33)^{a}	(2.35)^{a}
Advanced decay	(2.26)^{ab}	(2.33)^{a}	(2.25)^{ab}
Complete decay	(2.16)^{b}	(2.31)^{a}	(2.11)^{b}
F	0.048*	0.656^{ns}	0.064$^{n.s}$

^{ns}*: non-significant*
**: significant level at 5%*

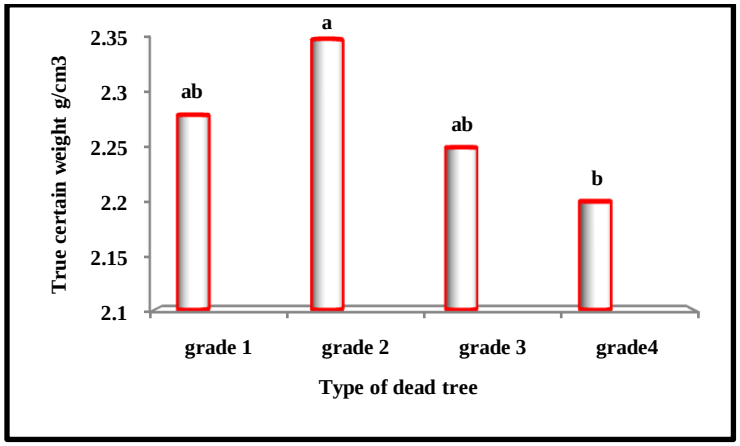

Figure 2: True specific gravity of soil dead trees in white pellets in the study area

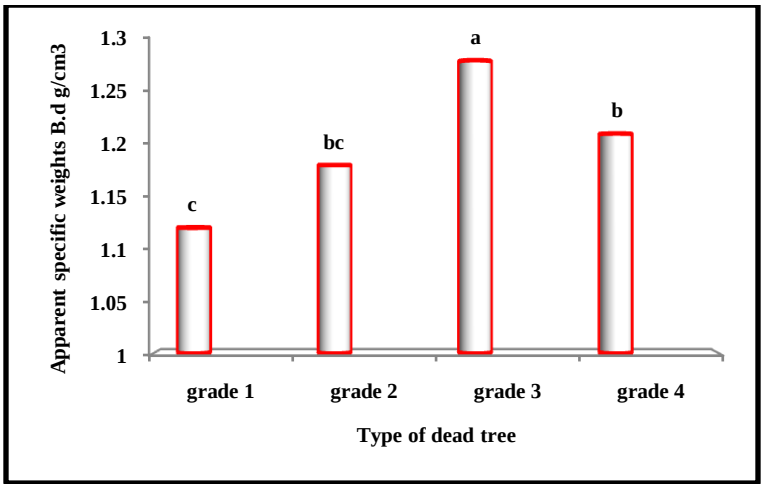

Figure 3: Apparent specific weights of soil dead trees in white pellets in the study area

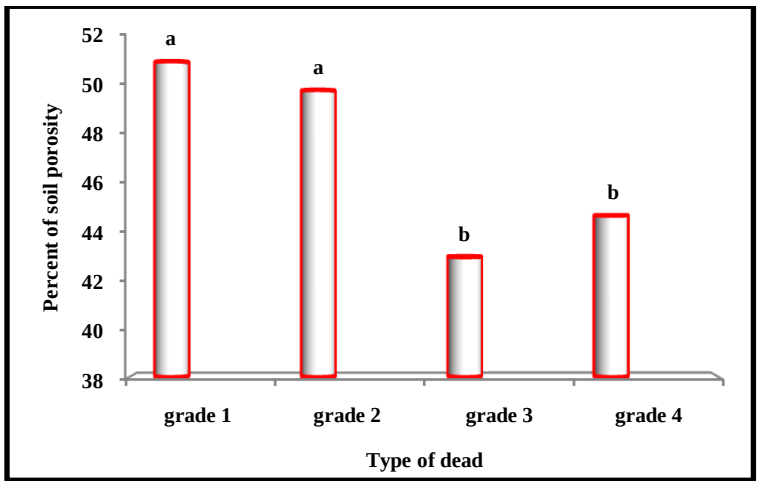

Figure 4: Percent of soil porosity of soil dead trees in white pellets in the study area

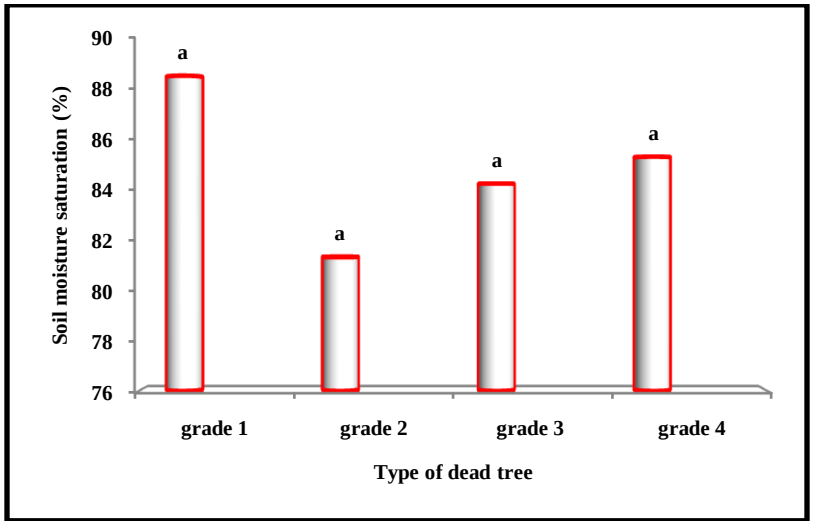

Figure 5: Percent of Soil moisture saturation of soil dead trees in white pellets in the study area

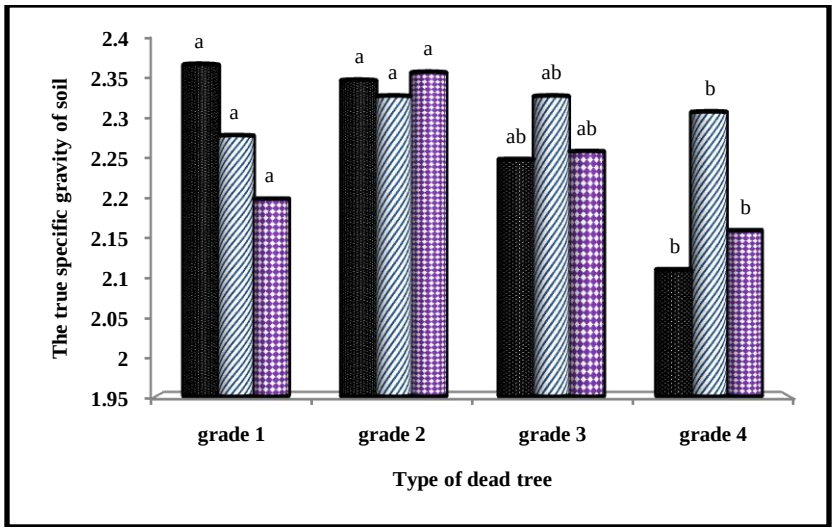

Figure 6: The true density of the soil at different distances from the white pellet of dead trees

The maximum amount of measured soil porosity of dead trees at one degree and minimum are available in dead trees in the third degree that there are significant differences between the porosity of subsoil of dead trees degree one and two with other types of dead trees in degree three and four (Figure 4). Figure 5 shows that saturated soil moisture content is not different in four of the dead trees of white pellets at degrees of one and two and three and four in 95% confidence level. There are significant differences in true specific gravity of soil in dead trees in degrees of 1 and 2 with degree 4fromdecay degree and true specific gravity of soil in different distances (Figure 6). Dead trees have small size role in forest ecosystem.But, they are very important because of the major role that the return of stored material into the soil (Yin, 1999; Treseder and Allen, 2000). Each element of present in food before any other secondary factors related to soil moisture. Decompose; releasing nutrients and energy in dead trees without adequate moisture is impossible. Perhaps, stating that the most important factor controlling the increase of nutrients in these types of dead trees depends on the amount of humidity. The result indicates properly dead trees surrounding areas had higher moisture and increased with increasing of moisture rot. In the early stages of

wood texture have coarse mode and potential for water retention is low in its but over time,and it turned to spongy,moisture stored with higher power that is matched with studies of Takahashi *et al.*, (2000). The results showed that among the physical properties of soils,the true density of the soil,soil bulk density, and demonstrated significant change between varying degrees of dead trees. In many studies it has been found dead trees can have significant effects on soil properties and this effect obtained directly and indirectly via changes in organic matter from dead trees. Persson (2012) in his studies on six different forest types in Sweden's forests stated that the amount obtained organic material of varying degrees of dead trees is very highthan control areas. Remarkable thing that in most of the studies cited,areas of study was mountain forests and in plain forests like the study area of this research little research work has been done. It seems that specific conditions and different forest study such as species,topographical conditions, high ground water and condensation water in different seasons,special circumstances created that of these elements do not change in varying degrees of dead trees. Difference in status of surface soil moisture and underground water in the study area is the main reason for the difference in results of the research cited. Among the physical properties of soils,the true specific gravity and bulk density have significant differences between varying degrees of dead. Graham and Wood (1991) stated that physical properties of soils such as porosity ,soil structure and gravity depend to habitat conditions. Therefore, it seems that an occurred difference in these characteristics in varying degrees of dead trees depends to habitat factors. Factors such as rainfall,slope of the land,wash top soil on surface water flow can be considered effective factors in changes in physical properties. Also, changes of this properties especially changes in soil texture and bulk density that is observed in varying degrees of dead trees in this study,can be affected on the other chemistries and biological of soil indirectly. Tamjidi (2012) believe that to influence of soil physical properties on activity of soil microorganisms and enzymes,that as a result,other chemical properties and feeding the soil will be change. Unchanged most of the physical properties of soils at varying degrees of dead trees in this study are interesting topics. As previously mentioned looks no significant differences in physical properties measured in this study,is concerned specific and different conditions studied forests such as species,topographical conditions,high ground water and condensation water in different seasons. It seems that condensation water in most seasons of the year and consequently water flow in forests is an important factor that has created uniformity of soil properties in different distances from dead trees. Base of this study and other researches, in this study, soil properties can be change in bottom of dead trees and various times. But, existence of water and it flow on ground level in many seasons has been prevent the accumulation different materials including organic that is many source of quality changes in physical properties in forest soils (Doran and Parkin, 1994; Doweling *et al.*, 1986). In fact, with the flow of water this material moves and is scattered in different distances from dead trees to uniformity and thus there are significant differences many soil properties in different distances from dead trees.

Conclusion

Since, there are little information about the process of converting dead trees into the soil, require that more extensive studies and monitored with time, this issue is explored. Because, consideration of ecological relationships in forest ecosystems,it is impossible without adequate attention to the presence of dead trees. It is therefore recommended that various studies should be performed about nutrient cycling in around dead trees,the number and diversity in the forest and relationship dead trees to type and amount of herbaceous cover,regeneration and tree.

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