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Effect of Softwood Fibers Cationization with EPTMAC and Mixing with CMP

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ABSTRACT

Utilization of long fiber chemical pulp to enhance the strength properties of mechanical and chemi-mechanical pulp is served as a common approach by the papermakers. Therefore softwood long fibers were exposed to chemical modification by cationic agent, EPTMAC, with the aim of reducing its consumption. Then, the cationised fibers were mixed with CMP pulp with given ratios and the handsheets were made. To evaluate cationization effect on long fiber consumption, the burst strength, tensile strength, tear strength and the degree of fines retention were determined. The results indicated that mixing cationised long fibers with CMP leads to enhance strength properties and fines retention, however high level of cationisation especially at high mixing ratio had partially negative effect on tear strength of hand sheets. The properties of hand sheets were improved significantly at 5% (based on O.D fiber weight) cationic agent. Generally, by cationic modification of long fibers by EPTMAC, their consumption can be reduced during mixing with CMP, while acceptable strength properties of resulted sheets are achieved too.

Keywords: cationization, CMP, EPTMAC, fines retention, long fiber, strength.

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Extraction and Characterization of Hydrophilic Extractives of Hardwood Knots

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ABSTRACT

In this study, hydrophilic extractives of Beech, maple, alder and hornbeam knots were isolated and characterized by means of gas chromatography - mass spectrometry (GC/MS). Also, antioxidant activity of the extracts extractives was studied. Hydrophilic compounds of the extractives were isolated by soaking the wood flour in the solvent. Isolation was made using a hexane pretreatment for removing the lipophilic moieties followed by an ethanol- water (v/v1: 9) treatment. Results showed that the type and amount of extractives in different species is different and maximum yield of 33.4% was obtained for hornbeam knots. TLC analysis showed that the compounds in ethanol extract were separated in only two distinct bands. Comparative evaluation of the total phenolics by Folin- ciocalteu and GC/MS analysis showed that extraction by simple soaking can accurately represent the amount of phenolic compounds in the extracts. Studying the antioxidant properties of extracts using DPPH radical scavenging and Iron (II) chelating capacity showed that the antioxidant activity is dependent to the amount and type of phenolics in the extracts.

Keywords: antioxidant properties, GC/MS, extractives, hardwoods, hydrophilic compounds, knot, soaking method.

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Investigation on Mechanical Properties of Polypropylene Composite Reinforced with Tobacco Stalk

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ABSTRACT

Tobacco is planted extensively in Golestan province and high volume of its stem wastes remained without using and it is burned. As a useful purpose of these wastes and to reduce the environmental problems, in this the mechanical properties of polypropylene composites reinforced with tobacco stalk flour were studied. For this purpose, the tobacco stalk flour as the reinforcement, in three levels of 30, 40 and 50%, maleic anhydride grafted polypropylene as a coupling agent in two levels of 4 and 6% as variable factors were used. The results showed that with increasing the amount of tobacco stalk flour, tensile stress decreased significantly but tensile modulus increased. Also increasing the amount of coupling agent improved tensile strength. Bending strength and bending modulus increased with increasing the amount of tobacco stalk flour and coupling agent. In the case of impact strength, no significant effects were observed between the different levels of the treatments. Therefore it is recommended to use 50 % tobacco stalk flour as a natural and biodegradable material with 6% coupling agent to make wood-plastic composite with desired mechanical properties.

Keywords: biodegradable, coupling agent, polypropylene, tobacco stalk flour, wood-plastic composite.

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The Effect of Vine Pruning Fibers Content and Press Time on some Functional Properties and Surface Roughness of Medium Density Fiberboard (MDF)

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ABSTRACT

In this research the possibility of vine pruning fibers in combination with wood fibers was studied in order to fabricate medium density fiberboard. Vine pruning fibers content in three levels of 0/100, 30/70 and 60/40 (weight percent) and press time in three levels of 4, 5 and 6 minutes was as variable factors. One layer panels with a density of 0.65 g.cm^3 and thickness of 15 mm were made. The physical and mechanical properties of panels including modulus of rupture (MOR), thickness swelling (TS) as well as surface roughness (Ra, Rz, and Rq) were measured. Results showed that with increasing of vine pruning fibers up to 30%, surface roughness and TS of panels increased and then decreased when the vine pruning fibers increased up to 60% fibers. MOR was reduced with increasing of vine pruning fibers up to 60%. Increasing press time had no significant effect on surface roughness and the physical and mechanical properties of panels.

Keywords: medium density fiberboard (MDF), press time, surface roughness, vine pruning fibers.

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Impact of Canopy Gap Size on Plant Species Diversity and Composition in Mixed Stands (Case study: Reserve Area, District No. 3 Asalem Forests)

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ABSTRACT

In order to study the effect of canopy gap size on species diversity and composition in mixed stands, a reserved area which located in Asalem forests was selected. All of gaps in this area identified and were divided into four categories: Small gaps (<200 m²), Medium gaps (200-500 m²) large gaps (500-1000 m²) and Extra large gaps (>1000 m²). In each category, 21 of gaps with a relatively homogeneous in terms of an aspect and slope were selected. The major and minor diameter of the gaps were measured and the area of the gaps was calculated based on an ellipse. Then, 2 m×2 m sampling micro-plots were systematically taken along two diameters of each gap. The number of individuals of tree seedlings and saplings and shrubs were counted and coverage percent of herbaceous species were estimated in each sampling plot based on Braun-Blanquet criterion. Number of species were counted and the Simpson (1-D), Shannon-Wiener (H') indices, species richness, Camagaro and Smith- Wilson's evenness indices were calculated in different vegetation layers. The Kolomogrov-Smirnov test was used to study the normality of diversity, richness and evenness data in different gaps, then One-Way and Kruskal- Wallis tests were performed using SAS software. The results showed that mean expanded gap sizes were 442.6 m². Also, the results revealed that there were not significant differences among different size gap categories in terms of diversity, but the composition of regeneration was significant among different gaps. Therefore, based on the results of this study, the medium gaps which area 200-500 m² in these mixed-species forests are recommended the species diversity.

Keywords: biodiversity, canopy gap, mixed stands, regeneration.

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Influence of Temperature and Holding Time in Oil Heat Treatment on Physical and Mechanical Properties of Fir Wood (*Abies Sp.*)

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ABSTRACT

Influences of temperature as well as holding time on physical and mechanical properties of Fir wood were studied in this work during the oleothermal wood modification. Wood samples were cut and treated oleothermally in the soybean oil at 200 and 230°C for the holding time of 1, 3 and 5 hours. Weights and the dimensions were measured before and after treatment. Bending strengths, water absorption and swelling, dry density and the impact load resistance (un-notched) were determined in the samples. Results revealed that the oleothermal treatment of wood had no significant effects on the density. Dimensions and the weights were reduced significantly in the treated wood. There was more reduction in the radial dimension than that of the tangential one. It means that wood was collapsed in this direction after treatment. Reductions in the water and moisture absorption as well as the swelling were determined in the samples. Bending tests revealed reduction in moduli of the elasticity and the rupture. There was no significant change in the impact load resistance of the treated samples.

Keywords: fir wood, oleothermal wood modification, mechanical Properties, physical properties.

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Comparison of Produced Film of Cellulose Nanofibers by Dried and Vacuum Filtrated Method from Unbleached Kraft Pulp of Kenaf Bast Fiber

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ABSTRACT

Nanofibrillated cellulose fibers were produced from unbleached kraft pulp of kenaf bast fiber. Air dried and vacuum filtrated films of cellulose nanofibers were produced and their density and tensile properties were investigated. Kenaf bast fiber unbleached kraft pulp has good potential for production of cellulose nanofibers by microfluidizer; so that the use of kenaf bast fiber unbleached kraft pulp suspension with consistency about 5.6% has the potential for cellulose nanofibers production. Transmission electron microscopy image showed the production of cellulose nanofibers with dimensions less than 100 nanometers. Although the apparent density of vacuum filtrated film was more than that of the air dried film (1105 compared to 1007 kg/m³), tensile strength index of the air dried film was more than that of the vacuum filtrated film (148 compared to 140 Nm/g). Tensile strength, tensile energy abortion index and strain at breaking percentage of the air dried film were more than those of the vacuum filtrated film too. However, the elastic modulus of vacuum filtrated film of cellulose nanofibers was more than that of the air dried film that it can be related to the apparent density different of these films.

Keywords: film of cellulose nanofibers, kenaf bast fiber, microfluidizer, strength properties, unbleached kraft pulp.

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Prioritization of Effective Criteria in Construction of Wood and Paper Industrials unit in Khuzestan Province with using of Bagasse as Raw Material

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ABSTRACT

The deficiency of wooden resources and rising demand of wood and paper products caused an increasing interest to the lignocellulose resources in the production of paper and wood composite production, such as bagasse. In Khuzestan province for build units of wood and paper industries with the approach of using bagasse as a raw material, 6 main indicator and 35 sub-indicator were prioritization. The main indices are included of materials and products, environmental infrastructures, economic, cultural and social, technical and technological, economic and financial and regulations. The questionnaires for prioritize of effective indicators, provided and by specialists and market experts, natural resource and university professors and good managers in wood industry, has been distribution and completed. The results of the questionnaires were analyzed by the Expert Choice software. and the most important sub-criteria is included the amount of Bagasse (0.103), rail transport (0.095), stable supply of Bagasse (0.093), factory distance from Bagasse's sources (0.090), the Storage System of bailing (0.073), the degree of factory flexibility in change the raw materials (0.073), amount of the sales of final product (0.068) and the quality of final product (0.045).

Keywords: Bagasse, effective criteria, sub-criteria, weighting values.

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The Effect of Pulp Suspension pH on the Performance of Chitosan –Nanobentonite as a Dry Strength Additive in Hardwood CMP Pulp

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ABSTRACT

In this research, the effect of pH on the performance of nanobentonite -chitosan system (as dry strength additives) in hardwood chemi-mechanical pulp (CMP) was studied. For this purpose, 3 levels of pH (5.5, 7, 8.5) and 3 levels of chitosan (0.75, 1.25 and 2% - based on oven dried pulp) in constant level of 0.3 nano-bentonite (based on oven dried pulp) were applied. The Atomic Force Microscopy (AFM) image confirmed the nano-structure of bentonite in thickness dimension at the range of 1-22.3 nm. The results indicated that nano-bentonite – chitosan in all levels of pH caused numerical improvement in tensile, burst and tear indices and also apparent density in comparison with control sample. Although the effect of studied variables (chitosan dosages and pH levels) on considered properties was statistically significant, but most of treatments were in the same groups according to Duncan grouping. In this research, treatment consisting of 1.25 chitosan in fixed level of 0.3 nano-bentonite at alkaline pH showed the best results in mentioned properties and statistically had significant difference comparing other treatments. Therefore, it was introduced as the selected treatment in this research. It seems that the ratio of chitosan and bentonite nano-anion had a great effect on performance of nano-particle system. Also the results showed that the performance of system depend on the pH of furnish and the best results was achieved in alkaline condition (pH=8.5).

Keywords: bentonite, chemi-mechanical pulp, chitosan, mechanical properties, paper making, wet end chemistry.

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Temperature and Radiation Based Methods against the Standard FAO Penman- Monteith for Estimating the Reference Evapotranspiration (ET_0) in Gorgan

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ABSTRACT

The FAO Penman- Monteith (F-P-M) method is now broadly accepted as the standard for estimating the reference evapotranspiration (ET_0). The method is also now used for evaluating the temperature-based [Blaney-Criddle (B-C) and Hargreaves-Samani (H-S)] and radiation-based [Jensen-Haise (J-H) and Turc (T_c)] methods. The objective was to compare the ET_0 estimated by the B-C, H-S, J-H, T_c methods with that estimated by the F-P-M method in a semiarid climate using the meteorological data recorded in Hashem-Abad Agro-Meteorological Station, Gorgan. The mean value of ET_0 was 3.13 mm.day^{-1} using the F-P-M method. At daily scale, T_c method showed the lowest RMSE (Root Mean Square Error), 0.98 mm.day^{-1} . At monthly scale, in compare to the other methods, the RMSE values by T_c method were lower in April as well as from September to March, averaged 0.06 mm.day^{-1} with the percentage error of 3%. During the summer season, July and August, however, B-C method suggested the lowest RMSE value than those of the others (RMSE 0.32 mm.day^{-1} with the percentage error of 6%). The H-S method behaves the best for monthly estimation (RMSE 0.42 mm.day^{-1} , the percentage error of 7%) during May to June. The F-P-M method for estimating ET_0 requires data often not recording in the meteorological stations; hence ET_0 should be estimated using the proposed simpler methods in compare to the F-P-M. The adaptation of the methods to different climates should be essentially tested by the standard F-P-M method.

Keywords: blaney-criddle, FAO Penman-Monteith, Hargreaves-Samani, Hashem-Abad Gorgan, Jensen-Haise, Semiarid climate, Turc.

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Seasonal Fluctuations Assessment of Log and Lumber Prices Using Multiple Regression Analysis (Case Study: Azarood Forest, Mazandaran)

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ABSTRACT

Knowledge of seasonal fluctuations is of great importance for sale management. The aim of this research is to assess the impact of sale season on the log and lumber prices. Hence, after evaluation of sale documents in Azarood forestry plan, the data of 410 timber sale lots at roadside of four seasons from 1992 to 2008 were extracted and incorporated into a dataset. Calculating the average selling price for each species group and products per season and year, four time series of seasonal price for two species group and products (log and lumber) were obtained. Then, all prices were deflated to the base year of 2007. The Augmented Dicky-Fuller test were then employed to evaluate stationarity of time series. Impact of season sale variables (independent dummy variable) on timber price was analyzed using multiple regression analysis, MRA, and stepwise method of SPSS 14.0 software. The impact of sale season on log and lumber prices was appeared to be significant for first species group while insignificant impact was found for second species group (at 5% level). The results revealed that selling lumbers and logs of first species group in summer and autumn caused a price raise of 13 and 11 percent (i.e., 120409 and 150798 Rial/m³ at constant prices of 2007) compared to other seasons, respectively. Wood trade and building boom in summer and autumn seems to contribute to timber prices raise in these seasons. Implications of such analysis seem to be of interest both for forest managers and wood industries.

Keywords: log price, lumber price, multiple linear regression, seasonal fluctuations, sale season.

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Application Analytic Network Process (ANP) in Designing Forest Road Network Based on Multifunction Forestry using

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ABSTRACT

Forests as a renewable source has effective and useful role in economic and social activities of society. Network of forest roads as infrastructure division's forest planning units (compartments) of forest management plans, management, logging, exit of Wood and plays a major role forest protection. Aim of this study, designed forest road network according to multi-purpose forestry using the network analysis model in the one series of Darabkla forest. For this purpose, initially, the effective criteria and alternatives in the design of forest road network in the area Determined, and then the network between criteria was designed. In the next step, using the expertise and ANP method, determined the final weight of effective alternatives in designing forest road network and maps required for this evaluation were provided. Then using weighted linear combination (WLC) potential final map was provided for road design. Then using the software Pegger was designed forest road network. Comparison of existing roads and proposed roads done by selecting 30 points in place of the two roads and Chi-square test. The results showed that the five classes of cross roads making plans for construction Road has significant difference at the level of 95%. In overall, the results of this study showed that the use ANP model with acceptable performance and has made a significant difference to the existing network.

Keywords: Darabkla, network analysis process, Pegger, weighted linear combination.

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Comparison of Effects of Polymer Material on Physical Properties of Forest Road Soils

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ABSTRACT

Stabilization, alter and improvement of engineering properties of soil are for providing predetermined goals. The most important aim of soil stabilization is increasing long term soil strength, but in very wet and loos lands the other aim of soil stabilization, is to decrease plasticity characteristic of soil, which are tested by Atterberg limits tests. Since the road soils of Namkhane District of Kheyroud forest, have fine grained texture, with high clay content and high plasticity, it's necessary to attempt to improve the mechanical properties and stabilize the soil, before road construction work starts. Nowadays with new technologies, polymer materials have been released. In the present study, compaction and Atterberg limits tests on samples of natural soil and treatment soils with different percentages of 2 types of polymer material CBRPLUS and RPP were studied. Also due to determine the effect of time on performance of these polymer material, samples treated with 0.05% CBRPLUS and 0.03% RPP prepared, stored for 7 and 14 days and then Atterberg limits tests were conducted on these samples. Result showed that with the addition of difference percentage of CBRPLUS to soil, liquid limit was changed between 3.27 and 22.05 and plastic limit was changed between 0.94 and 6.97. The plasticity index decreased between 4.8 and 32.5. Adding RPP decreased the liquid limit between 4.93 and 14.27, plastic limit between 3.14 and 8.57 and plasticity index between 13.22 and 24.03. The results of Atterberg limits indicate that add this material causes improvement of plasticity properties of soil, and treatment time technical has no significant influence on plasticity properties of soils. Also results of compaction test indicate that add CBRPLUS to soil, increase maximum dry density between 1.58 and 9.85 and optimum moisture between 3.57 and 23.21. Adding RPP, somewhat (0.75 and 1.58%) improve the maximum dry density of soil. It has no effect on optimum moisture. Generally according to achieved results, add this material to soil cause relative improvement of soil characteristics.

Keywords: CBRPLUS, plasticity properties, polymer materials, RPP, soil stabilization.

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Prioritization of Appropriate Sub-basins in order to Forest Harvesting using HEC-HMS Model (Case Study: Kheyroud Forest)

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ABSTRACT

Forest cover is one of the most effective factors in reducing flooding in northern Iran, so that in recent years the destruction, land use changing and uncontrolled harvesting of forest areas, has greatly increased the number and magnitude of floods. So far, there have been few studies on forest hydrology in Iran, particularly the northern Hyrcanian forests. This study examines the impact of a hypothetical harvesting operation, on the basin output hydrograph, will provide the opportunity to study the prioritization of forest basin for harvesting operations. SCS method and rainfall - runoff HEC-HMS model were used to simulate the design flood return periods of 2, 5, 10, 25, 50 and 100 years. The results showed that the A1 and A2 sub-basin have maximum peak flow at the outlet that ranked in the first place of flooding. So that, the implementation of harvesting scenarios in these sub-basin, the f and $F\%$ indices values have been increased intensively than other sub-basins, Although, it was similar trend between harvesting operation increasing and increasing f parameters in A1 and A2 sub-basins. But considering the area, greatly increases of the hydrological response to the harvesting operation was occurred in the A1 sub-basin. Results for positioning suitable areas for harvesting operations, also showed that the priority order of B3, A4, B2, A3, B1, A2, and finally A1 sub-basins. With implementation of the harvesting operation scenarios over 21 percent, in the most sub-basins, the amount of peak flow and flood volume have been increased greatly.

Keywords: flood simulation, flooding, forest harvesting, HEC-HMS model, prioritization.

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Effects of GA3 and Stratification on Seed Germination of Field Maple (*Acer campestre* L.)

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ABSTRACT

Dormancy breaking of field maple (*Acer campestre* L.) seed, by gibberlic acid (GA3) at 0, 250, 500 and 1000 ppm in 24 and 48 hours and stratification treatments in moist sand under warm (18-20°C) and cold (2-4°C) conditions were investigated. Effects of GA3 and stratification and their interaction on germination percent (GP) and germination speed (GS) were significant. The highest GP occurred at warm (12) (53%) and warm (8) (38%) without GA3, and at warm (12) with 1000 ppm GA3. At treatments with and without GA3 combined with cold stratification (34 weeks) no germination appeared. The highest GS allocated to warm of 12 without GA3, and then in such stratification combined with 1000 ppm GA3 (24 and 48 hours). At 500 and 1000 ppm GA3, the GS enhanced with increasing warm stratification period and decreasing cold stratification period. This research implies that stratification of *A. campestre* seed under 12-22 weeks warm-cold stratification is a relatively good treatment to remove dormancy. Continuation of experiment with longer periods of warm stratification or with some seed germination-promoting hormones may be resulted in better breaking dormancy of *A. campestre* seed.

Keywords: cold stratification, dormancy breaking, field maple, GA3, seed germination.

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Relationship between *Moringa peregrina*, *Salvadora oleiodes* and *Capparis decidua* Habitats and Soil Characteristics in Sistan & Balochestan Province by CCA Method

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ABSTRACT

Moringa pregerina (Forssk.) Fiori., *Capparis decidua* (Forssk.) Edgew. and *Salvadora oleides* Decne. are important indigenous shrub or tree species of Sahara-Sindian region which distributed and formed scattered woodlands in south east of Iran. The current research was carried out to find most effective soil characteristics in their distribution. For this purpose, a study was conducted in the Balochestan province of southeast Iran in 2008 for four years. Based on a vegetation map and field surveys, indicator sites were identified. Within each site, 1-3 profiles were dug. Soil sample was taken from 0-60 cm. Measured soil properties included: pH, EC, K, P, N, sand, silt, clay, T.N.V, gypsum, T.D.S. and texture. To determine the most soil effective factors on plants, multivariate techniques, including Canonical Correspondence Analysis (CCA) was applied. The results indicated that between three species habitats, only there are significant differences in nitrogen percent, gypsum and electrical conductivity. The CCA results indicated that the main edaphically factors affecting the distribution of *Moringa pregerina* are total neutralizing value (T.N.V) and clay percentage, and for *Salvadora oleides*, total neutralizing value(T.N.V), total dissolved solid (T.D.S.) and sand percentage are effective factors and total neutralizing value(T.N.V) and total dissolved solid(T.D.S) characters play important roles in *Capparis decidua* presence .

Keywords: *Capparis decidua*, CCA method, *Moringa peregrina*, presence, Sahara-Sindian, *Salvadora oleoides*.

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Effect of the Seed Location on the Mother Plant and Salinity Stress on Seed Germination Characteristics of *Eucalyptus comaldulensis* Dehnh

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ABSTRACT

The present study was conducted to evaluate the effects of these two factors as well as their interaction on seed germination of eucalyptus (*E. camaldulensis*). A factorial experiment based on a completely randomized design with three replications was used. Five salinity levels including 0, 50, 100, 150, 200 mM sodium chloride were tested on seed collected at top, middle and bottom of the tree. Also the electrical conductivity of leaves as well as 1000- seed weight were measured in three different tree heights. Result showed that 1000- seed weight and electrical conductivity of leaves were significantly different ($P < 0.05$) in three heights. Maximum leaves electrical conductivity and 1000- seed weight were obtained in seeds collected from middle Crown depth. Furthermore, total seed germination percentage, speed of germination, mean daily germination, Germination index, shoot and root length, as well as seed vigor were significantly reduced ($P < 0.01$) with increasing the salinity stress. However, the responses were difference based on location of seeds on the mother tree. Highest mean daily germination, Germination index, speed of germination, root and shoot length and seed vigor were obtained in seeds collected from the middle Crown depth, whereas maximum seed germination percentage was related to seeds located at the lower high of the tree.

Keywords: germination percentage, leaves electrical conductivity, seed vigor, Yazd, 1000 - seed weight.

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The Effects of Participatory and Governmental Management on the Diversity of Wooden Varieties using Diversity Parametric Models

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ABSTRACT

In order to investigate the effects of management models on the diversity of wooden species, forests of third series of Shiler, the first division Mehrbanrud watershed and third and fourth series of eight division of Behshahr – Neka townships were studied with participatory and governmental management respectively. The diversity of the wooden species have been evaluated by diversity parametric models such as geometric series, log series, log normal series as well as broken stick. At first, the radius of local people influence on the forests of the study area has been defined through interviewing with ranchers, doing field studies with GPS. Then, samples of 0.1 ha have been designed in the forest areas which were under the control of local people. Totally, the study area contained of 62 sample plots. The number and the type of wooden species were defined in each plot. Data analyzing was done using PAST software. The result showed that both two regions (region with participatory management and region with governmental management) follow the log normal series model. The results showed that both regions have mature, natural and varied forest resources. Also, forests under governmental management follow the log series model more than the participatory ones. This means that the forests under the governmental management have relatively less numbers of each species. Generally, participatory management conserves the forests structure and their species diversity better than the governmental management.

Keywords: broken stick, geometric series, log normal, log series.

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