Quantification of beech stands structure in the stem exclusion phase

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ABSTRACT

Evaluating the forest stands structure in different development stages is one of the ways for better understanding the forest dynamics and its response to natural disturbances. This study was carried out in the compartment 319, Kheiroud forest in order to quantify the structure properties of mixed beech stands in the stem exclusion phase. For this purpose, three one-hectare sample plots were selected in which stand structure characteristics were measured. The quantitative characteristics of two beech trees closest to grid intersection (30×30 m) as reference trees, were also measured along with three nearest neighbors to reference trees. The distance and angle between reference tree and neighbor ones and also the distance among neighbor trees were calculated. The results indicated that the average value of uniform angle index and species mingling were 0.53 and 0.51, respectively which implies random distribution of trees and tending beech to being mixed with other tree species and inter-species competition of this species with hornbeam. The average value of tree to tree distance was 4.7 m. Meanwhile diameter and height differentiation were 0.44 and 0.57, respectively indicating high density and competition in this phase to access the sources and better growth conditions.

Keywords: Beech, Mingling index, Quantification, Stand structure, Stem exclusion phase.

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Social monitoring: network analysis and social capital in sustainable forest resources management (case study: Kodir village, Kojur, Mazandaran province)

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ABSTRACT

Forest management as one of the important source of production is crucial and critical. In taking over the forest resources as one of the most important of natural resources in the world, it is essential to consider local stakeholders to implement forest action plan for forest co-management. Therefore, this study aims at achieving to proper management of forests based on evaluating the stakeholder participations in management planning. For this purpose, social monitoring based on the relationship between local stakeholders was done and finally social network analysis was applied as an efficient tool in evaluating the relationships. In this study, quantitative and mathematical indicators of network analysis among all stakeholders in Kalak customary in Kojur region, Mazandaran province were investigated based on the trust and cooperation connections in local stakeholder network. The results showed that social cohesion and social capital in local stakeholder networks in this area are average to high level and sustainability of the network is strong. Furthermore, the result also revealed that there is medium correlation between trust and collaboration links in local stakeholders in the study area. According to the result, it could be concluded that maintenance and improvement of social trust will increase the social control and stakeholders will respect local traditions and rules in exploiting the forest resources.

Keywords: Co-management, Kodir village, Local stakeholder network, Social capital, Social monitoring, Social network analysis.

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Forest density classification using IRS satellite image and non-parametric KNN method

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ABSTRACT

Proper forest management needs quantitative and precise estimates of forest stands characteristics. Remotely sensed imageries, due to accurate and broad spatial information, has become a cost-effective tool in forest management. Classification of forest attributes and generation of thematic maps are among the common applications of remote sensing. The objective of this study was to optimize the density classification (number of trees per hectare) in forest stands using non-parametric KNN method in Pilambara, Shafarood watershed, west of Guilan province. This study showed that KNN method with k=6, as the optimum number of nearest neighbors, and Euclidian distance presented acceptable results with RMSE=228.58 (number of trees per hectare), relative RMSE=78.9% and correlation r=0.50 in mapping the stand densities in the study area. The accuracy rate and kappa coefficient of classified thematic map were 85.19% and 0.56, respectively. It is concluded that the KNN algorithm as a non-parametric method could classify the forest density properly.

Keywords: Forest density, KNN, Satellite image, Shafarood.

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Cryopreservation of *Ulmus glabra* Hudson seeds

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ABSTRACT

Wych elm (*Ulmus glabra* Hudson) is one of the forest species in Hyrcanian forests of Iran and considered as threatened species due to its narrow ecological range, over-exploitation, as well as Dutch elm disease. In order to evaluate the possibility of cryopreservation of *Ulmus glabra* seeds for long-term preservation, seeds were collected from natural habitats and three pre-treatment methods including PVS2, Desiccation, and 30% Glycerol were applied before incubating the seeds in liquid nitrogen (-196°C). The treated seeds were incubated in liquid nitrogen (LN) for periods of 0 week (without exposure to LN), 1 week, 1 month, and 1 year. After removing the cryopreserved seeds from LN, seed germination, seed vigor, and other attributes were evaluated under laboratory conditions. Furthermore, seedling establishment was assessed under greenhouse conditions. Desiccation had the best effects on survival rate and other attributes of the cryopreserved seeds. However, PVS2 and 30% Glycerol had negative effect on all the attributes. The seeds of *Ulmus glabra* are able to tolerate cryogenic conditions and cryopreserved seeds are able to grow into normal plants. Seeds of the species can be collected from different areas and preserved for long periods using desiccation pre-treatment method before incubation in LN.

Keywords: Endangered species, Seed cryopreservation, *Ulmus glabra*, Wych elm.

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Effect of different treatments on seeds survival and growth of Ziziphus spina -Christi seedlings

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ABSTRACT

The considerable role of *Ziziphus spina christi* in preserving water and soil and its resistance to heat and drought, the necessity of planting this species for afforestation and restoration of their habitats and urban green space is obvious. The aim of this study was to determine the best irrigation and seedbed treatments before planting for *Ziziphus spina Christi* seedling production. This study was done in Masjedsoleiman nursery as factorial experimental design with three treatments i.e. scratching the seeds in three levels, the planting bed in four levels, and irrigation in three levels as unbalanced completely random design. The result of analysis of variance showed that the main effects of all treatments (planting bed, method of irrigation and scratching) and their interaction effects on viability percentage were significant ($p < 0.01$). In different methods of scratching, the seeds soaked about 48 hours in water, six hours in acid had the most, and the least survival rate, 48.24% and 4.26%, respectively. Also for traits including the survival percentage, length of the stem, length of the root, the dried weight of stem and proportion of dried weight of stem to the dried weight of root, the semi heavy soil with the average of 54.81%, 17.4 cm, 16.96 cm, 0.148 g and 1.45, respectively was the best cultivation bed. The results showed the planted seeds with every day watering had the most amount of survival (48.29%) and the length of the stem (13.6 cm). The dried weight of the stem was 0.109 g and the dried weight of the root was 0.93 g with every day watering. The rate of plant growth was higher and the function of the plants in sense of weight was influenced. Also the treatment combinations of heavy soil in every day watering in soaking seeds for 48 hours and the heavy soil with every day watering in 2 hours seed soaking acid, had the least survival percentage with 60% and 1.11%, respectively. Reduction in soil heaviness led to lower seed survival rate. The correlation coefficients of collar diameter with dried weight of the root (0.83), stem length with dried weight of the stem (0.85), root (0.85) and dried weight stem with root (86%) were positive and significant ($P < 0.1$). The survival percentage showed no significant correlation with seedling reproductive traits. The results showed viability and the weights of 1000 seeds had proper conditions for germination and shooting. The different scratching ways with softening the seeds hard cover was easier and led to increasing the germination.

Keywords: Germination, Irrigation, Nursery, Survival, *Ziziphus spina Christi* seed.

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Studying the possibility of forest ecotourism development using multi criteria evolution and geographic information system

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ABSTRACT

This study aims at identifying the suitable areas for ecotourism using geographic information system (GIS) and analytical hierarchy process (AHP) in experimental and educational Kheyroud forest, Nowshar, Mazandaran province. The evaluation process was conducted based on three groups including ecological, infrastructural, and socio-economic criteria. Then, the indicators of each main groups were determined. The indicator maps of slope, elevation, aspect, temperature, soil, water resources, landscape, wildlife, vegetation cover (density and type), cow-pens, forestry plan and road were generated in geographical information system environment. The Analytical Hierarchy Process was used for weight determination of indicators. Finally, based on the weighted linear combination method, weighted layers of indicators were integrated in GIS environment and ecotourism suitability map was created. According to the results, slope and water resources indicators and soil and cows-pens indicators showed the highest and lowest weights, respectively. In addition, the results of evaluation revealed that 0.17, 38.15, and 61.88 percent of the area have high, medium, and low suitability for ecotourism purposes, respectively. According to the ecological indicators and the development of infrastructural and socio-economic criteria, there is an extensive potential for ecotourism development in the Kheyroud forest.

Keywords: AHP, Development, Ecotourism, Evaluation, Kheyroud forest, WLC.

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Comparison of *Populus caspica* growth behavior and their progenies

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ABSTRACT

Degradation of natural habitats and decreasing of genetic diversity of *Populus caspica* led to vast reduction of its regeneration and growth potential in north of Iran. Hence, the growth potential of mass-produced seedlings was compared with their parents. For this purpose, the ramets of three selected seedlings from 17 parent trees belonging to north of Iran, along with ramets of their parent trees, totally 1020 ramets, were planted as a randomized complete block design with three replicates. During growing season of 2013, height growths of the seedlings were measured for 6 time periods. Results showed significant differences in height growth among the time periods, progenies, parental trees, and their interactions. Seedlings of Mazandaran 5, Gilan 3 & 4 and Golestan 3, revealed the best results. In the other hand, Mazandaran 4, Golestan 5 & 6 revealed the worst results. July and August showed highest height growth. During all of the time periods, progeny height growth was more than that of their parents, so that mean height growth of progenies and parents were 285.1 and 250.4 cm, respectively. In addition, mean diameter of progenies, 20.9 mm, was significantly more than that of their parents with a value of 18.2 mm. As the main result of this research, high performance of seed-born seedlings of *P. caspica* progenies (due to superiority of sexual reproduced seedlings compared to asexual reproduced ones) can be used for reforestation in degraded forests in northern part of Iran.

Keywords: Height growth, *Populus caspica*, Sexual reproduction.

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Predictive habitat distribution modeling of *Amygdalus scoparia* Spach in Moshakieh rangelands of Qom Province

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ABSTRACT

This study aims at comparing the performance of logistic regression, maximum entropy, and multi-layer perceptron techniques in preparing the predictive habitat distribution map of *Amygdalus scoparia* in rangelands of Qom province. For this purpose, vegetation sampling was done using random systematic methods after identifying pure habitats of this species. For soil sampling, eight profiles were excavated and two samples were taken from 0-30 and 30-80 cm depth. After analyzing the soil characteristics in the laboratory and generating the layers of physiographic characteristics (slope, aspect, and elevation), geology and physical and chemical characteristic of soil, predictive habitat distribution modeling was performed. Then the accuracy of generated map was evaluated by kappa. Based on the calculated kappa coefficient, logistic regression model was able to predict the habitat distribution of studied species at the excellent level (kappa= 0.91). Meanwhile, predictive maps derived from maximum entropy and multi-layer perceptron had very good aggrement with actual map (kappa 0.85 and 0.8, respectively). These results indicate that the logistic regression model is more accurate than other methods for predicting the distribution of this species due to specific circumstances. Based on logistic regression model, geological formation (Igneous formations) and soil gravel amount are the most influential factors effecting the the presence of this species in this habitat. These results indicate that in order to select the optimal modeling approach, it should be given special attention to the ecological niche of the species studied in addition to the capabilities of each method.

Keywords: *Amygdalus scoparia,* Logistic regression, Maximum entropy, Moshakieh rangelands, Multi-layer perceptron, Predictive model.

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Investigation on the multipurpose planning in Zagros forests

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ABSTRACT

Degradation of Zagros forests has been continuing since a long time ago because of traditional and often improper exploitations due to poverty, unemployment, and livelihood. In this study, in order to reduce forest degradation and improve sustainability, the feasibility of multipurpose using of Zagros forest was assessed in Baneh forests by using GIS, RS and AHP. All of the possible land-uses as well as criteria and sub-criteria were identified based on expert's judgment and literature reviews. Sub-criteria maps was created using available data, field works, and IRS-P6 imageries. The weights of sub-criteria were determined using AHP. The priority maps of each land-uses was produced with a weighted linear combination method using GIS. The final priority map was achieved by overlying the individual land-use priority maps. The final ecological capability map was prepared by editing the priority map. The results show the main area of current land-uses does not match with the ecological potential. However, ecologically, various land-uses meaning multiple-use can exist separately or together in the study area leading to reducing people's dependence on forest trees, degradation and improving the forest sustainability.

Keywords: Analytical hierarchy process, Ecological capability, Multi-purpose use, Remote sensing, Zagros forests

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Soil carbon stock and its relationship with physical and chemical characteristics in soil of different land-uses in Zagros region

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ABSTRACT

The present study aimed at estimating the amount of carbon storage and its relationship with other physical and chemical soil properties in four land-use systems including intact, protected, exploited and garden-uses areas in the northern Zagros region in west Azarbaijan Province, Iran. Thirty sample plots were identified and within each plot, soil samples were taken in each land use and each same unit, and some soil properties including organic carbon, bulk density, texture, saturation, percent porosity, pH, electrical conductivity, total nitrogen, lime, phosphorus and potassium solution were analyzed. The carbon storage in 0-15 and 15-50 cm of soil in different land-uses was respectively in intact area, 90.96 and 128.92 tons per hectare, in protected area, 82.85 and 173.99 tons per hectare, in exploited area, 78.26 and 119.26, and in garden-uses area, 34.75 and 58.95 tons per hectare. The results of statistical tests showed that there are significant correlation between the amount of lime, sand, silt, porosity, bulk density, saturation, potassium, phosphorus, conductivity, organic carbon, C/N, and the amount of carbon storage. Based on the modeling, the percentage of organic carbon, bulk density and porosity percentage had the greatest impacts on the amount of carbon storage.

Keywords: Carbon sequestration, Forest soil, Land-use, Northern Zagros.

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Studying the ecological requirements and quantitative properties of *Crataegus azarolus* L. natural stands in west Azerbaijan province

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ABSTRACT

Crataegus as a woody multipurpose species based on fruit production is very important for local residents in the Northern Zagros forests located at the south of West Azerbaijan province. This study aimed at determining the quantitative characteristics, soil and physiographic properties in the *Crataegus* spp. stands. In current study, eight *Crataegus* habitats were selected and 3-5 0.1 ha circular sample plots, totally 33 sample plots, were established in each habitat by random systematic method. General characteristics of sampling plot and dendrological properties including diameter at breast height, origin of trees, large and small diameters of canopy were measured. Ten soil samples were taken within studied habitats. The results showed that pH, organic carbon content, total nitrogen and clay are the most effective soil factors on the distribution of *Crataegus* species. In addition, results imply that *Crataegus azarolus* and a few *pyrus* appear with increasing the soil pH and clay and south-facing slopes. Other *Crataegus* species associated with such species as *Malus*, *Quercus*, *Salix*, *Fraxinus*, and *ulmus* are observed with improving the soil fertility, increasing the organic carbon and total nitrogen and north-facing slopes. The maximum and minimum diameter at breast height of *Crataegus* species individuals were observed in Galatian site (17.42 cm) and in Darre Shohada (6.61 cm), respectively and also the maximum and minimum of average canopy area were observed in Mirabad 2 (24.3 m^2) and Darre Shohada site (4.49 m^2), respectively. It is recommended that *Crataegus azarolus* would be planted in the western and southern aspects and low soil fertility and other species of this genus would be planted in northern aspects with higher soil fertility.

Keywords: Canopy area, *Crataegus azarolus*, Habitat, Stand, Zagros forests

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Comparison of stand and soil characteristics of pure and mixed plantations of *Populus deltoides* and *Alnus subcordata* (case study: Chamestan, Mazandaran province)

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ABSTRACT

The aim of the present study is to assess the effect of pure and mixed plantations of Eastern Cottonwood (*Populus deltoides*) and Alder (*Alnus subcordata*) on quantitative stand characteristics and soil properties. The experiment was established in 1994 using randomized block design with five treatments (1- P100%, 2- P67%-A33%, 3- P50%-A50%, 4- P33%-A67%, and 5- A100%) and four replicates in Chamestan Forest Research Center, Mazandaran province. All trees were measured and mixed soil samples were taken from 0-20 cm depth in all treatments in 2014. Result of ANOVA showed that after 20 years, there are significant differences in tree attributes including diameter at breast height, height, crown width, and leaf area index as well as stand attributes including basal area, volume and leaf area per hectare. The maximum growths of poplar were recorded in P33%:A67% treatments with an average of 35.0 cm DBH, and the maximum growth of Alder were recorded in 100%A treatment with an average of 25 cm. No significant difference was observed in soil properties between different treatments. Based on the results, P33%:A67% treatment is the best treatment for future plantations.

Keywords: *Alnus subcordata*, Plantation, Chamestan, Soil, Growth, Mixed plantation

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Epidemiology of oak decline: spatial-temporal mortality pattern of oak in a Golestan chestnut-leaved oak forest (Case study: Qoroq forest park)

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ABSTRACT

Evaluating the population density and spatial pattern of infected trees are one of the important criteria for selecting the management method and epidemiology of forest diseases. This study aimed at assessing the damage intensity and spatial-temporal mortality patterns of oak in Qoroq forest park, Golestan province. the health of oak trees was evaluated in seven transects by using quarter-point method in 2013 and 2014. The results showed that the rate of infection and decline of oak trees in Qoroq forest park has heterogeneous distribution, so in the western part of the park, damage intensity and rate of infection and mortality are higher. Initially the dead trees indicated *strong* spatial *clustering* at larger scales (900 m) and after a year, intensity of clustering was less pronounced so that at 200, 400, 600 and 800 m, weak clusters are formed. However the co-occurrence analysis of disease severity damage showed that newly infected trees and dead trees had a negative association and occurred in the clusters away from the dead trees, but the trees with high damage was strongly related to the mortality. The results can be a suitable model for planning conservation applications and protection of infected oak forests and monitoring the oak decline.

Keywords: Epidemiology, Oak decline, Qoroq forest park, Spatial-temporal pattern.

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Investigation of the bending moment and stress carrying capacity in L-shaped biscuit joints fabricated with solid wood and wood based composite

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ABSTRACT

This study was aimed to investigate the bending moment and stress (inner and outer corners) in L-shaped biscuit joint made of solid wood, particleboard and medium density fiberboard (MDF). For this purpose, L-shaped joints made of Beech and Fir, particleboard and MDF by biscuit size numbers of 0 ($47 \times 15 \times 3.8$ mm), 10 ($53 \times 19 \times 3.8$mm) and 20 ($60 \times 23 \times 3.8$mm). Bending moment and stress carrying capacity of the joints were compared to each other. Results showed that bending moment and stress carrying capacity in inner and outer corners of joints were increased by increasing the biscuit size from 0 to 20 (increasing length and wide of biscuit). The Lowest value of these resistance observed in 0 size biscuit. The Results also showed that joints made with Beech were superior to Fir regarding to the measured properties in MDF and particleboards.

Keywords: Biscuit joint, Solid wood, Stress carrying capacity, Bending moment, Wood based composite.

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Bioincising impact of *Pysisporinus vitreus* and *Xylaria longipes* fungi on radial air permeability and moisture diffusion coefficient of spruce wood (*Picea abies*)

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ABSTRACT

In this research, the bioinsising impact of two wood decay fungi (*Pysisporinus vitreus* and *Xylaria longipes*) on radial air permeability and moisture diffusion coefficient of spruce wood (*Picea abies*) was investigated. Fungal cultivation was performed in an incubator at 25 °C and 85% relative humidity for 15, 30 and 45 days. Results showed that the permeability, moisture diffusion and mass loss were increased by increasing the incubation time about both fungi but compression strength was decreased. Maximum mass loss was observed for 30 and 45 days treatments of *Pysisporinus vitreus* fungus. The increased air permeability and moisture diffusion are probably due to degradation of bordered pits of tracheid cell walls by *Pysisporinus vitreus* and formation of several holes on tracheid cell by *Xylaria longipes*. The results of this research showed that 30 days incubation for both fungi was an optimum and best incubation time for increasing the radial air permeability and moisture diffusion in spruce (*Picea abies*) wood.

Keywords: Bioincising, Permeability, Moisture diffusion coefficient, *Pysisporinus vitreus*, *Xylaria longipes*.

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Using hybrid of fish glue-phenol formaldehyde in plywood manufacturing

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ABSTRACT

In this study, hybrid of phenol formaldehyde-fish glue was used to replace the chemical resin in plywood manufacturing. For this purpose, fish glue was applied at three levels including 0, 10 and 20 percent based on the dry weight of resin. Physical and mechanical properties of manufactured plywoods were measured. Thickness swelling after 2 and 24 hours immersion in tap water, bending strength, modulus of elasticity and the bonding shear strength of prepared plywoods were measured. The results showed that dimensional stability and thickness swelling upon 2 and 24 hours immersion in water were significantly improved by increasing the fishglue content. On the other hand, by increasing the fish glue content up to 20 percent, bending strength, shear strength and modulus of elasticity (parallel and perpendicular to the grain of top layer) were increased.

Keywords: Plywood, Fish glue, Phenol formaldehyde, Bending strength, Shear strength.

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Effect of thermal accelerated aging of mixed hardwoods CMP paper on mechanical and optical properties of its recycled pulp

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ABSTRACT

The old newsprint, as an important grade of waste papers, usually has been produced from chemical-mechanical pulp (CMP). Although the effect of paper aging on different properties of recycled pulp has been investigated from long time ago; but, few studies have been observed about the effect of this phenomenon on recycling of CMP paper. In this study, accelerated aging was applied on Hardwood CMP newspaper by 2 levels of temperature (50 and 100˚c) and 2 levels of time (24 and 48 hours). Results showed that accelerated aging applying 100˚c in 24 and 48 hours (about half of a decade and more) impose an intense reduction tensile strength, burst strength and tear strength indices as well as folding endurance strength of recycled pulp. Also, accelerated aging in 50˚c for 24 and 48 hours (about six months until one year) did not show any special effect on mentioned mechanical properties. Moreover, thermal accelerated aging didn't have any significant effect on brightness of deinked CMP pulp. In general, it can be concluded that CMP waste papers less than one year old can preserve or even upgrade their mechanical properties after recycling, but aging more than half of a year will have detrimental effect on these properties.

Keywords: Chemical mechanical pulp, Brightness, Waste paper, Thermal accelerated aging, Deinking, Mechanical properties.

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The influence of nanochitosan addition on the process and quality properties of printing and writing paper made from recycled fibers

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ABSTRACT

Improving the processing and the recycled paper properties is one of permanent concern of papermaking. In this research, the effect of nanochitosan addition on the process and product quality made of writing and printing recycled fiber was investigated. Being nano size and so its capability in access to the space between pulp suspension components and also its probable ability to make electrostatic and hydrogen bonds are the characteristics of nanochitosan. For this purpose, the chitosan nanoparticles were prepared and their size and shape was confirmed with AFM and FE-SEM. Also, the change in FTIR spectrum after conversion of chitosan to nanochitosan was considered and omitting the $-NH_2$ in chitosan and creation of $-CONH$ groups in nanochitosan by polymerization between chitosan and meta acrylic acid were confirmed. In next step, nanochitosan in four levels (0, 0.5, 1, 1.5 and 2% based on oven dry pulp) was used. The results indicated that nanochitosan was successful in increasing the mechanical properties (tensile, burst and tear indices) and process properties (drainage and fines retention) comparing the control treatment (no additive). Moreover, the comparing of nanochitosan and chitosan performance in the same consumption level (1% based on oven dry pulp) showed similar effect on mechanical properties but chitosan had better performance in process properties. Also, both of this polyelectrolyte showed better results on mechanical properties comparing the cationic starch at the same consumption level (1% based on oven dry pulp).

Keywords: Drainage, Recycled paper, Chitosan, Retention, Nanochitosan, Strength properties.

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