

Received: 07 Oct. 2013

Accepted: 17 Nov. 2014

Factors regulating the litter mass loss in pure Norway spruce plantation in Lajim region

- ❖ **F.Gh. Aghbash***; Assist. Prof., Faculty of Forestry, Malayer University, Malayer, I.R. Iran
- ❖ **Gh.A. Jalali**; Assoc. Prof. of Forestry, Faculty of Natural Resources and Marine Science, Tarbiat Modares University, Nour, I.R. Iran
- ❖ **V. Hosseini**; Assist. Prof. of Forestry, Faculty of Natural Resources, Kordistan University, Sanandaj, I.R. Iran
- ❖ **M. Hosseini**; Assoc. Prof. of Forestry, Faculty of Natural Resources and Marine Science, Tarbiat Modares University, Nour, I.R. Iran

ABSTRACT

Litter decomposition process is a vital process in forest biogeochemical cycles causing nutrient release into the soil. Lignin degradation is considered as the limiting step in litter decomposition. This research was done to study the factors regulating the litter mass loss of beech (*Fagus orientalis* lipsky), alder (*Alnus subcordata* C.A.Meyer), maple (*Acer velutinum* Boiss.) and Norway spruce (*Picea abies* (L) Karst) in late decomposition stages for 405 days using litterbag method in pure Norway spruce plantation in Lajim Region. The findings of this study showed that litter decomposition of all litters had a positive and significant correlation with initial litter nitrogen and manganese concentrations ($P < 0.05$ and 0.01 , respectively) and negative correlation with lignin concentration, C:N and lignin:N ratios ($P < 0.05$). In addition, the results showed that the correlation between mass loss and releasing of nitrogen, manganese and lignin is significant and this correlation was negative only for manganese. According to the results, it was found that the composition of deciduous species litters, especially beech and spruce needles in the Hyrcanian mountainous forests can be effective in accelerating the decomposition process.

Key words: Leaf litter, Lignin, Litter decomposition, Manganese, Nutrient releasing.

* Corresponding author, Email: f.ghasemi@malayeru.ac.ir, Tel: +989122379717

Received: 12 Nov. 2013

Accepted: 14 Dec. 2014

Evaluating the quantitative estimation of wood products in forest management planning and its effect on income and stumpage price (case study: Lavij forest management planning)

- ❖ **H. Alaei**; MSc. Student, Faculty of Forest Sciences, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran
- ❖ **M.H. Moayeri***; Assoc. Prof., Faculty of Forest Sciences, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran
- ❖ **S. Kian**; PhD Student, Faculty of Natural Resources and Marine Sciences, Tarbiat Modares University, I.R. Iran

ABSTRACT

Presenting a certain scientific approach in forest management planning and utilization guideline with the aim of prediction of forest wood products for a certain period for estimating the income amount and economical balance of the plan is essential. The purpose of this research is to evaluate the existing method in distribution of harvesting between species forming the forest structure and predicting forest products in forest management planning and its effect on income and stumpage price. So, harvesting volume, type of removal species and the estimated forest products in the approved booklet and harvesting program are compared with corresponding numbers of the ten-year implementation of Lavij forest management planning and the result were presented as descriptive and analytical. The results showed that the marked volume by species, volume renewal and predicted wood products based on harvesting manual are not compatible with ten-year operations of the forestry plan. Assuming that the income and cost indices are fixed in all wood product sectors and other operational costs of this plan, the variations obtained through the species, volume and form of wood products caused increase of income and cost 9.29 and 1.03 percent, respectively. The effect of these variations caused the increase of government contribution amount of 237 percent. Consequently, the base stumpage price of industrial stems and fuel woods changed from 5.3% and 1630 Rails to 18.03% and 4808 Rails, respectively.

Key words: Volume percent, Forest harvesting manual, Government contribution, Product form, Type of species.

* Corresponding author, Email: Moayeri@gau.ac.ir, Tel: +989111719613

Received: 10 Aug. 2014

Accepted: 06 Jan. 2015

Alteration of phosphatase activity and physiochemical properties of soil in different development stages in beech stand (case study: Rezvanshahr)

- ❖ **T. Alizadeh***; MSc., Research Institute of Forests and Rangelands, Tehran, I.R. Iran
- ❖ **M. Matinizadeh**; Assoc. Prof., Research Institute of Forests and Rangelands, Tehran, I.R. Iran
- ❖ **A. Salehi**; Assist. Prof., Faculty of Natural Resources, Guilan University, Some Sara, I.R. Iran
- ❖ **K. Taheri Abkenar**; Assist. Prof., Faculty of Natural Resources, Guilan University, Some Sara, I.R. Iran

ABSTRACT

The development of forest ecosystems comprises three stages including initial, optimal and decay. In all these stages, the changes in canopy volume and amount of light reaching lead to changes in soil physiochemical and biological properties. Enzymes activities as biochemical properties are of the most important indicators to determine the soil quality. This research aims at assessing the soil condition in different development stages. For this purpose, phosphatase enzymes activities and some physical properties of soil in different development *stages of Fagus orientalis* Lipsky forests in Rezvanshahr area were determined. Soil samples were randomly taken from 0-10 and 10-20 cm depths. Activity of phosphatase enzymes was measured by spectrophotometry method. Some physical properties of soil such as bulk density, porosity were determined by standards methods. The results indicated acid and alkaline phosphatase enzymes activities were significantly different in terms of silt percent ($p \leq 0.01$), bulk density amount, and first depth ($p \leq 0.05$) in three development stages. The values of all measured properties were higher in decay stage except for bulk density amount in 0-10 cm depth than two other stages. In addition, the activity of acid phosphatase (depth 0-10) and alkaline phosphatase (depth 10-20) was positively correlated with available phosphorus in decay stage. It is concluded that the decay stage provides better conditions to the soil micro-organisms and phosphatase activity.

Key words: Acid phosphatase, Alkaline phosphatase, *Fagus orientalis*, Soil biology.

* Corresponding author, E-mail: Talizadeh@rifr-ac.ir, Tel: 09128069266

Received: 21 Aug. 2014

Accepted: 12 Jan. 2015

Systems recording and identification of agroforestry practices (case study: Feridan and Chadegan citis, Isfahan province)

- ❖ **S.M. Hasani***; MSc. Student, Department of Silviculture and Forest Ecology, Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran
- ❖ **Gh. Zahedi Amiri**; Prof., Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran
- ❖ **S.M. Heshmatolvaezin**; Assoc. Prof., Faculty of Natural Resources, University of Tehra, Tehran, I.R. Iran
- ❖ **M. Avatefi Hemat**; Assist. Prof., Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran
- ❖ **S.H. Matinkhah**; Assist. Prof., Faculty of Natural Resources, Isfahan University of Technology, Isfahan, I.R. Iran

ABSTRACT

Due to lack of agroforestry research in Iran, it is important to identify the existing agroforestry systems in order to create a database for further researches. Feridan and Chadegan citis, west of Isfahan province are two areas in which the various agroforestry systems have been developed. These two regions were selected for research because of providing the easy access and a variety of systems. The goal of this study was to design a method to collect, detect and record the data in the interdisciplinary field of agroforestry. Therefore, it was meant to introduce the traditional science of agroforestry and to create the necessary research backgrounds plus the development of this knowledge. Field observations, interview, recording the basic information, primary Carlowitz method (1972) and Mathinkhah et al (2003) method were adopted for describing and recording the agroforestry systems. The informations were recorded in special forms for each system based on Matinkhah et al (2003) criteria and eight cases of Carlowitz method for nomenclaturing systems. Furthermore, several adjustments were performed in accordance with region conditions and added to the existing criteria. Finally, 17 different agroforestry systems were identified and documented in the study. The descriptions of these systems are provided in the paper according to the 22 criteria. Also there is a list of the system names, region with principal criteria of trees, crops and forage in which exist in Nair (1993) classification. These systems were classified according to the ecological and climatic conditions, the level of technology and social and financial conditions.

Key words: Agroforestry, Systems recording, Chadegan, Feridan.

* Correspondence author, Email: mohsenhassani@ut.ac.ir, Tel: 09370966072

Received: 23 Oct. 2014

Accepted: 31 Jan. 2015

Estimation of production and logging costs in Shafaroud logging company

- ❖ **F.K. Behjou***; Assoc. Prof., Faculty of Agriculture and Natural Resources, University of Mohaghegh Ardabili
- ❖ **B. Majnounian**; Prof., Department of Forestry and Forest Economics, Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran
- ❖ **M. Namiranian**; Prof., Department of Forestry and Forest Economics, Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran
- ❖ **J. Fegghi**; Assoc. Prof., Department of Forestry and Forest Economics, Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran
- ❖ **A. Saeid**; Assist. Prof., Department of Forestry and Forest Economics, Faculty of Natural Resources, University of Tehran, Tehran, I.R. Iran

ABSTRACT

Sustainable forest management in Caspian forests of Iran requires cost-benefit analysis in order to maintain the quality of timber stands during logging operations. This study was done with the aim of cost and gross revenue computations from current logging (net present value) in three adjacent compartments in district 2 of Shafroud watershed. Motion and time studies were carried out during felling, bucking, skidding, loading, and hauling operations. The weighted average price for one cubic meter wood was computed 2565090 Rials in three compartments. The study of costs per cubic meter showed that 128314 Rials were devoted to logging costs, 158175 Rials to road construction costs, 8161 Rials to skid trail construction costs, and 71223 Rials to overhead costs. On the other hand, the total production cost per m³ is 365873 Rials of which 90% pertains to fixed costs. The results of this study suggest that government should increase the stumpage price, and governmental logging companies should pay costs due to severe damages to forests after logging operations.

Key words: Net present value, Cost-revenue analysis, Average weighted price.

* Corresponding author, Email: farshad.keivan@gmail.com, Tel: 09124595203

Received: 23 June 2014

Accepted: 01 Mar. 2015

Overcoming seed dormancy and improving germination characteristics in *Acer monspessulanum sub turcomanicum*

- ❖ **V. Payamnoor***; Assist. Prof., Faculty of Forest Science, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran
- ❖ **Gh. Salavati**; M.Sc. Student, Faculty of Forest Science, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran
- ❖ **A. Ali-Arab**; Assist. Prof., Faculty of Forest Science, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran
- ❖ **V. Mohammadi Chiane**; M.Sc. Student, Faculty of Forest Science, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran

ABSTRACT

This research aims at finding the best treatment for seed dormancy breaking, improvement of germination and vegetative characteristics of *Acer monspessulanum sub turcomanicum*. Seeds were collected from Siah Marz Kouh, 18 kilometers from south east of Gorgan city, Golestan province and were treated under cold stratification for 2, 4 and 6 months as well as gibberellic acid (250 and 500 ppm), fungicide (Dyphno Conazol) and pesticide (Imida Chloride). Germination characteristics including germination percent, germination capacity, germination energy, germination value, germination speed, vigor index and vegetative characteristics including root length, shoot length and plant biomass were also measured. Results showed that the seeds need six-month stratification for seed dormancy breaking. Gibberellic acid at 250 ppm concentration increases the germination characteristics after this period. Four-month stratification had no effect even for seeds treated with gibberellic acid that is usually applied to shorten the stratification period.

Key words: Seed dormancy, *Acer monspessulanum*, Germination, Vegetation.

* Corresponding author, Email: mnoori56@gmail.com

Received: 10 Sept. 2014

Accepted: 26 Apr. 2015

Improving the ordination of ecological species group using diagnostic species concept

- ❖ **O. Esmailzadeh***; Assist. Prof. of Forestry, Faculty of Natural Resources and Marine Science, Tarbiat Modares University, Malayer, I.R. Iran
- ❖ **S.S. Soleymanipor**; MSc. Student of Forestry, Faculty of Natural Resources and Marine Science, Tarbiat Modares University, Nour, I.R. Iran

ABSTRACT

This research aims at ecological classification and identifying diagnostic species of box tree (*Buxus hyrcana* Pojark) sites in Farim forests, Sari, Iran. The data were collected from 60- 400m² sample releves in systematic- selective design (200 × 400 meter) by considering the indicator stand concept. Floristic data were analyzed using modified TWINSpan and consequently, six ecological groups were classified. The results of diagnostic species analysis based on Phi fidelity index revealed that of the 77 species recorded, only 47 species had positive fidelity to presented groups ($P < 0.05$) and therefore they were determined as diagnostic species of box tree plant communities in the study area. Detrended Correspondence Analysis (DCA) was used to represent the distribution pattern of ecological groups based on two data matrix of plant species canopy cover, full data and only diagnostic species. Comparisons of scatter plots of ecological groups along two first axes in DCA, as well as, result of cumulative traced variances in two series data (37.1% in only diagnostic species data and 26.2% in total species data) in this analysis clearly indicated that ordination of six groups based on only diagnostic species data presents more appropriate distribution pattern compared to full species data. It is concluded that application of diagnostic species may lead to improve the results of ecological group ordination in determining the effective environmental variables precisely on considered groups.

Key words: Box tree (*Buxushyrcana*), DCA, Diagnostic species, Ecological groups, Farim, Modified TWINSpan, MRPP.

* Correspondence author, Email: oesmailzadeh@modares.ac.ir, Tel: 01144553101-3

Received: 14 July 2014

Accepted: 15 July 2015

The effect of drought stress on photosynthetic characteristics in Walnut (*Juglans regia* L.) seedlings

- ❖ **N. Seyedi***; Assist. Prof., Department of Forestry, Faculty of Natural Resources, Urmia University, Urmia, I.R. Iran
- ❖ **A. Alijanpour**; Assoc. Prof., Department of Forestry, Faculty of Natural Resources, Urmia University, Urmia, I.R. Iran
- ❖ **A. Banj Shafiei**; Assoc. Prof., Department of Forestry, Faculty of Natural Resources, Urmia University, Urmia, I.R. Iran
- ❖ **H. Beygi Heidarlu**; PhD Student of Forestry, Faculty of Natural Resources, Urmia University, Urmia, I.R. Iran

ABSTRACT

Restriction in gas exchanges is one of the reasons in reduction of the plant growth in water scarcity and drought stress conditions. In this study, the effect of drought stress on gas exchange characteristics of 36-two year old Persian walnut (*Juglans regia* L.) seedlings were studied in complete randomized design with nine replicates and four treatments. In terms of drought, irrigation treatments 100 (control), 75, 50, and 25 percent of the potential water were applied according to water requirement of walnut in field capacity. Photosynthesis, transpiration, stomatal conductance, and CO₂ concentration were measured before and after the stress using IRGA gas exchange instrument. Based on the analysis of variance, photosynthesis, stomatal conductance and mesophilic conductance had significant difference among irrigation treatments. The statistical comparison with Duncan's multiple range test showed that the rate of photosynthesis and stomatal conductance at 25 and 50 percent of irrigation treatments had significant differences with the control. Significant difference was also observed for mesophilic conductance between 50 percent and control treatment. Meanwhile, there was no significant difference for all measured parameters between 75 percent and control treatment. Therefore, saving water for irrigation of the plants can be reduced to 75 percent of field capacity.

Key words: Field capacity, Gas characteristics, Gas exchanges, Irrigation, Walnut.

* Corresponding author, Email: n.seyedi@urmia.ac.ir, Tel: 04432770489

Received: 01 Nov. 2014

Accepted: 07 June 2015

Investigation on the soil carbon sequestration in natural forest and different plantation types (case study: Chamestan forest, Mazandaran)

- ❖ **Z. Badehian**; Assist. Prof., Department of Forestry, Faculty of Agriculture, Lorestan University, I.R. Iran
- ❖ **M. Mansouri***; PhD, Student, Department of Forestry, Faculty of Agriculture, Lorestan University, Lorestan, I.R.Iran
- ❖ **M. Fasehat**; MSc. Student, Department of Forestry, Faculty of Natural Resources and Marine Sciences, Tarbiat Modarres University, Nour, I.R. Iran
- ❖ **M.A. Fakhari**; MSc., Department of Natural Resources, Nour, I.R. Iran
- ❖ **S.M. Hosseini**; Assoc. Prof. Faculty of Natural Resources and Marine Sciences, Tarbiat Modarres University, Nour, I.R. Iran

ABSTRACT

Forest ecosystems and their optimal management can play effective roles in mitigating the carbon emission as well as absorbing the atmospheric carbon. The present research was carried out to determine the effects of 21 year old stands of *Cryptomeria japonica*, *Cupressus sempervirens*, *Pinus taeda*, *Acer pseudo-platanu* and mixed plantation and natural forest stands on sequestration of carbon in the soil of Chamestan plantation area. The results showed that the difference of carbon in pure, mixed and natural stands, in different layers are statistically significant. Moreover, there are not any significant correlations between the acidity of the soil, nitrogen, salinity and phosphorus and carbon sequestration. For the total layers of the soil (0-45 cm), the rate of carbon sequestration in natural stands (108 ton/ha) was significantly higher than other stands ($P<0/01$). The results of stepwise regression showed that nitrogen percentage and C/N ratio were the most important factors affecting the soil organic carbon content. Overall, it can be concluded that programs of land restoration can be followed in terms of carbon sequestration through the identification of plant species with high potential for carbon sequestration and also evaluation of effective management factors.

Key words: Plantations, Soil, Carbon Sequestration, Chamestan.

* Corresponding author, E-mail: masoomehmansoori91@gmail.com, Tel: 09197316313

Received: 28 Oct. 2013

Accepted: 12 Jan. 2015

Hot water pre-extraction of Barley straw and its effect on soda and monoethanolamine pulps properties

- ❖ **N. Mohammadi Yanghagh;** MSc., Faculty of Natural Resources, University of Tehran, Karaj, I.R. Iran
- ❖ **S. Hedjazi*;** Assoc. Prof., Faculty of Natural Resources, University of Tehran, Karaj, I.R. Iran
- ❖ **A. Abdulkhani;** Assoc. Prof., Faculty of Natural Resources, University of Tehran, Karaj, I.R. Iran
- ❖ **Y. Hamzeh;** Professor, Faculty of Natural Resources, University of Tehran, Karaj, I.R. Iran

ABSTRACT

In this study, hot water pre-extraction of barley straw followed with soda and monoethanolamine pulping was investigated. Pre-extraction that resulted in removal of 28 % of barley straw hemicelluloses and pre-extraction yield of 72.7 % was selected as the optimum pre-extraction treatment. The pulping results show that among the pulps from pre-extracted barley straw and barley straw without pre-extraction, monoethanolamine pulps have the highest yields. Also, the yields of pulps were drastically dropped after hot water pre-extraction. At the same pulping conditions, the kappa numbers of pulps that produced from pre-extracted barley straw were decreased more than that of from barley straw without pre-extraction in soda pulping, but this effect is not seen in the case of monoethanolamine pulps. Pre-extraction of barley straw followed with soda pulping resulted in pulps with higher tensile, burst and tear indices in comparison to untreated samples. In the case of monoethanolamine pulp the similar trend can be seen in except of tensile index. The brightness of pulps from pre-extracted barley straw is decreased while the pre-extraction has no effect on pulp opacities.

Keywords: Hot water pre-extraction, Barley straw, Soda pulp, Monoethanolamine pulp, Mechanical properties, Optical properties.

* Corresponding author, Email: shedjazi@ut.ac.ir, Fax: 026-32249311

Received: 28 Oct. 2013

Accepted: 12 Jan. 2015

Investigation on effective indices in development of wooden furniture industry for developing countries

- ❖ **M. Ghofrani***; Assoc. Prof., Department of Wood and Paper Science and Technology Faculty of Civil Engineering, Shahid Rajaei Teacher Training University, I.R. Iran
- ❖ **F. Rahimi**; MSc., Wood Natural Resources Engineering, Shahid Rajaei Teacher Training University, I.R. Iran
- ❖ **H. Noori**; MSc., Wood Natural Resources Engineering, Shahid Rajaei Teacher Training University, I.R. Iran
- ❖ **M. Azizi**; Professor, Wood and Paper Science and Technology, Faculty of Natural Resources, University of Tehran, I.R. Iran

ABSTRACT

Due to the very small share of the global market of Iranian furniture and the need to improve the situation in Iran, this study was aimed to determine the factors contributing to the development of furniture industry in developing countries and provide strategies for improvement in Iran. 29 criteria and sub-criteria under 6 general criteria including, human resources, socio-cultural, economic, political, technical and environmental aspects were analyzed using analytical hierarchy process according to the basic studies and internet communications with foreign experts and scholars and interviews with local experience professionals and technicians, the degree of importance of each one of the has-been identified. The results show that the standards of education, labor, government support for the production, marketing strategies, product innovation and cheap labor, respectively. The highest rating, and also human resource development strategy and human resources index were found the most appropriate solution and the most sensitive indicators.

Keywords: AHP, Developing countries, Furniture, Human resources.

* Corresponding author, Email: ghofrani@srttu.edu, Tel: + 98 21 22970060

Received: 06 Nov. 2014

Accepted: 29 June 2015

Influence of nanoclay on physiochemical, thermal and structural properties of urea formaldehyde resin

- ❖ **H. Younesi-Kordkheili**; Assist. Prof., Department of Wood and Paper Science and Technology, Semnan University, Semnan, I.R. Iran
- ❖ **S. Kazemi Najafi**; Professor, Department of Wood and Paper Science and Technology, Tarbiat Modares University, Noor, I.R. Iran
- ❖ **R. Behrooz***; Assoc. Prof., Department of Wood and Paper Science and Technology, Tarbiat Modares University, Noor, I.R. Iran

ABSTRACT

In this research, the effect of nanoclay on physiochemical, thermal and structural properties of urea formaldehyde resin (UF) was investigated. The prepared GLUF resin was mixed mechanically with the 0.5, 1 and 1.5% nanoclay for 5 min at room temperature. The physicochemical properties of the prepared resins were measured according to standard methods. Also, the thermal and structural changes in UF resin containing nanoclay were measured by Differential Scanning Calorimetry (DSC), Fourier Transform Infrared Spectrometry (FTIR) and X-ray Diffractometry (XRD). The physicochemical test results indicated that by addition of nanoclay the viscosity, solid content and density values were increased while the free formaldehyde and gelation time of resin were decreased. FTIR analysis indicated that the addition of nanoclay decreased the methylene linkages in UF resin. Moreover, the new peak was appeared at 850 and 1140 cm^{-1} bands in nanoclay filled UF resin dealing that a chemical interaction between nanoclay and UF resin was accrued. According to DSC analysis nanoclay accelerates the curing temperature of resin while the onset and temperature peaks dramatically decreased. XRD analysis showed that nanoclay completely exfoliated in UF resin.

Keywords: Urea formaldehyde resin, Nanoclay, Structural properties, Thermal property.

* Corresponding author, Email: Rabi.behrooz@modares.ac.ir Tel: 09113954174

Received: 27 Feb. 2015

Accepted: 30 June 2015

Investigation on thermal energy and activated carbon production from Furfural residue

- ❖ **F. Jadidian**; MSc., Islamic Azad University, Science and Research Branch, Tehran, I.R. Iran
- ❖ **M. Talaeipoor**; Assoc. Prof., Department of Wood and Paper Science, Science and Research Branch, Islamic Azad University, Tehran, I.R. Iran
- ❖ **S. Mahdavi***; Assoc. prof., Wood and forest products division, Research Institute of Forests and Rangelands (RIFR), Tehran, I.R. Iran
- ❖ **A. H. Hamassi**; Assoc. Prof., Department of Wood and Paper Science, Science and Research Branch, Islamic Azad University, Tehran, I.R. Iran

ABSTRACT

The purpose of this study is the utilization of furfural residue for heating energy and activated carbon production. To evaluate the energy production of the residue, bulk density, melting point, and heating value were measured. Furthermore, moisture, ash, volatile compounds, fixed carbon, lignin, and elements were determined. Ash and volatile content average were measured at 15.4% and 68.9%, respectively. The bulk density average of the residue powder with 40-60 mesh was determined at 0.30 g/cm³. There are significant difference between lignin content and melting point of furfural residue with wood which were measured at 8.55% and 950 °C, respectively. Also, it was found major difference between the average sulfur content of the waste and other biomass that is important in terms of environmental pollution. Gross heating value directly was measured by calorimetric bomb to 18.2 MJ/kg that is nearly to wood. The activated carbon produced from pyrolysis of furfural residue was chemically activated with zinc chloride. The chemically activated carbons were characterized by measuring iodine of 547 mg/g, specific surface (BET) of 501 m²/g, and pore diameter of 5.41 nanometer. It seems that the obtained activated carbon is suitable for liquid absorption according to the pore size. According to the results obtained in this study, thermal energy production from furfural residue is not recommended due to environmental pollution, but it is suitable for activated carbon production that could be used in the water purification industry.

Keywords: Furfural residue, Energy production, Moisture, Gross heating value, Activated carbon.

* Corresponding author, Email: smahdavi@rifr-ac.ir Tel: 09153173096

Received: 15 Apr. 2015

Accepted: 04 July 2015

Upgrading the qualitative characteristics of mixed recycled ONP and OMG pulps with hemicellulase

- ❖ **I. Akbarpour***; PhD Student, Department of Pulp and Paper Industries, Faculty of Wood and Paper Engineering, Gorgan University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran
- ❖ **A. Ghasemian**; Assoc. Prof., Department of Pulp and Paper Industries, Faculty of Wood and Paper Engineering, Gorgan, I.R. Iran
- ❖ **H. Resalati**; Professor, Department of Wood and Paper Engineering, Faculty of Wood and Paper Engineering, Sari University of Agricultural Sciences and Natural Resources, Sari, I.R. Iran
- ❖ **A. Saraeian**; Assoc. Prof., Department of Pulp and Paper Industries, Faculty of Wood and Paper Engineering, Gorgan, I.R. Iran
- ❖ **A.J. latibari**; Professor, Faculty of Wood and Paper Engineering, Azad University, Karaj, I.R. Iran

ABSTRACT

Enzymatic deinking has been suggested as an environmentally friendly alternative to complement and replace for conventional chemical deinking. In the present research, the effect of hemicellulase from *Aspergillus niger* has been evaluated on paper quality of mixed 70% old newspaper (ONP) and 30% old magazine (OMG) pulp. Hemicellulose was used at different charges of 0.1 (H₁), 0.2 (H₂), 0.5 (H₃) and 1 (H₄) percentages based on oven dry weight of pulp and different times of 40 (T₁), 50 (T₂), and (T₃) under constant conditions of %10 consistency, temperature 55-60 °C at pH range of 6.5-7 and then the pulps were washed and floated. The results showed that compared to undeinked pulp (C₁) and chemical deinked pulp (C₂), papers with higher brightness, whiteness and appropriate opacity could be achieved at % 0.2 enzyme concentration and duration time of 60 min (H₂T₃) and also % 0.5 enzyme concentration and duration time of 50 min (H₃T₂). Also, the results of assessments indicate that the highest tensile index (32.271 and 30.017 Nm/g), breaking length (3.131 and 2.974 km) and stiffness (3.94 and 4.12 mN) were observed in treatments of H₂T₃ and H₃T₃, and the highest tear index (7.688 and 7.34 mN.m²/g) was observed in treatments of H₁T₁ and H₁T₂ respectively. These results are more desirable than paper produced with treatment samples of C₁ and C₂. In general, achieved results from this research indicate that hemicellulase has a good potential to improve the quality of mixed recycled ONP and OMG waste papers vs. standard conventional system.

Keywords: Old newspaper, Old magazine, Hemicellulase, Optical properties, Strength properties.

* Corresponding author, Email: iman.akbarpour@gmail.com, Tel: +989113534809

Received: 05 Mar. 2015

Accepted: 15 Aug. 2015

Improving paper breaking length using cellulosic nanofibers in bagasse pulp

- ❖ **M. H. Moradian***; Assist. Prof., Behbahan Khatam Alanbia University of Technology, Behbahan, I.R. Iran
- ❖ **P. Rezayati Charani**; Assist. Prof., Behbahan Khatam Alanbia University of Technology, Behbahan, I.R. Iran
- ❖ **M. A. Sadatnia**; Assistant Prof., Behbahan Khatam Alanbia University of Technology, Behbahan, I.R. Iran

ABSTRACT

Pars paper factory adds imported long fiber pulp which is made from softwoods to its bagasse pulp to reinforce the paper strength, thereby incurring high expenses to this factory. This research aimed to assess the replacement of different systems of additives (cationic starch-bentonite, cellulose nanofibers-cationic starch, cellulose nanofibers- cationic polyacrylamide) with long fiber pulps, while keeping the paper breaking length to the extent of adding 15% imported long fibers. The results showed adding 1 percent cationic starch leads to enough breaking length, but according to possible process problems adding lesser amount of starch (0.75 %) with 3 % cellulosic nanofibers was also investigated, which could attain suitable paper breaking length. In addition, a treatment without starch but with 7.5 % cellulosic nanofibers and 0.03 % cationic polyacrylamide could also reach to an equivalent breaking length of adding 15 % long fiber pulp. Furthermore, adding bentonite with cationic starch to bagasse pulp resulted in a little improvement in pulp drainage.

Keywords: Bagasse, Pulp, Breaking length, Cellulosic nanofiber, Cationic starch.

* Corresponding author, Email: moradian_h@yahoo.com, Tel: 06152730493

Received: 14 June 2015

Accepted: 30 Sept. 2015

The effect of hemicellulose on the enzymatic and mechanical fibrillation efficiency of soda bagasse fiber

❖ **S. R. J. Petroudy***; Assist. Prof., Department of Paper and Cellulose Technology Engineering, Faculty of New Technologies and Energy Engineering, Shahid Beheshti University, Scientific and Research Campus, Zirab, Mazandaran, I.R. Iran

ABSTRACT

Hemicelluloses are the second most abundant polysaccharides in the lignocellulosic materials such as wood and non-wood plants. In this research, high pressure homogenizer (HPH) was used to produce cellulose nanofibers from two different pulps from bagasse with different amount of hemicelluloses. Also, endoglucanase enzyme pre-treatment was applied to hinder the aggregation of produced fibers and to reduce energy consumption during homogenization process. The amount of fiber fibrillation was analyzed as cellulose nanofiber thickness and surface roughness using laser profilometry (LP) and field emission scanning electron microscopy (FESEM). The results showed that the thickness of the prepared cellulose nanofibers were less than 40nm and there is a direct relationship between hemicellulose content and bagasse cell wall fibrillation. Moreover, paper sheets that contains more hemicelluloses showed a lower LP roughness as well as thinner cellulose nanofiber than that of dissolved pulp. Since roughness can be considered as most important characteristic for fibrillation study, as a result in this study the facilitator effect of hemicellulose for fibrillation was corroborated.

Keywords: Bagasse, Dissolving pulp, Filed emission scanning electron microscopy, Hemicelluloses, Homogenizer, Laser profilometry.

* Email: sr_jafari@sbu.ac.ir, Tel: 01245355003

Received: 07 Mar. 2015

Accepted: 25 Nov. 2015

Evaluation alternative in MWPI's newsprint production with mixture of species on the properties of CMP paper

- ❖ **M. Goli***; MSc., Department of Natural Resources, University of Agricultural Sciences and Natural Resources, Sari, I.R. Iran
- ❖ **S. M. Zabihzadeh**; Assoc. Prof., Department of Wood and Paper Science and Technology, Faculty of Natural Resources, University of Agricultural Sciences and Natural Resources, Sari, I.R. Iran
- ❖ **G. Asadpuratoei**; Assist Prof., Department of Wood and Paper Science and Technology, Faculty of Natural Resources, University of Agricultural Sciences and Natural Resources, Sari, I.R. Iran
- ❖ **A. Barzan**; PhD Student, Department of Pulp and Paper Science and Technology, University of Agricultural Sciences and Natural Resources, Gorgan, I.R. Iran

ABSTRACT

The effects of mixing forest hardwood species (including Oak, Maple & Persimmon) and non-forest ones (including Willow & poplar) on optical and mechanical properties of newsprint produced from CMP were investigated. These species were used instead of MWPI's common used species (including Beech & Hornbeam) regarding to the forest resources diminishing. The pulp (CMP) was prepared under conditions of 85% yield and different cooking times (25-60 min.), temperature of 170°C, L/W= 1/7. The optical and mechanical properties of hand sheets with a basis weight of 60 g/m² have been assessed. Results indicated that the quality of paper was increased by increasing the amount of Poplar and also it was found that the best strength and optical properties were related to the treatments with higher amounts of hornbeam or poplar. However, it should be noted that acceptable results can be achieved by using low amounts of other species mixed with higher percentages of Poplar.

Keywords: Forest and non-forest hardwood species, Newsprint, CMP pulp, Mechanical and Optical properties.

* Corresponding author, Email: goli.me2020@gmail.com, Tel: 09113554926

Received: 07 Mar. 2015

Accepted: 25 Nov. 2015

The potential of deinked waste paper sludge in gypsum fiberboard production

- ❖ **B. Haj Mehdi**; MSc., Wood and Paper Science and Technology Depts., Agricultural and Natural Resources Faculty, Azad Islamic University, Karaj branch, Karaj, I.R. Iran
- ❖ **S. Pourmoussa***; Assist. Prof., Wood and Paper Science and Technology Depts., Agricultural and Natural Resources Faculty, Azad Islamic University, Karaj branch, Karaj, I.R. Iran
- ❖ **A. J. Latibari**; Professor, Wood and Paper Science and Technology Depts., Agricultural and Natural Resources Faculty, Azad Islamic University, Karaj branch, Karaj, I.R. Iran
- ❖ **A. Tajdini**; Assoc. Prof., Wood and Paper Science and Technology Depts., Agricultural and Natural Resources Faculty, Azad Islamic University, Karaj branch, Karaj, I.R. Iran

ABSTRACT

Application of cellulosic fibers and minerals of deinked waste paper sludge has a great impression on utilization and characteristics of final product. This study was designed to produce use gypsum-fiber board from the DIP sludge. The gypsum: sludge ratio was considered as 100:0, 90:10, 80:20, 70:30 and 60:40. Two types of gypsum boards were prepared with fixed 12 mm thickness and cold pressing time of 10 and 20 minutes at 30 kg/cm². The results revealed that, regarding the fact that the DIP sludge contains a variety of short fibers with excessive amount of minerals, increasing the sludge loading could affect the compatibility of gypsum and sludge. The effect of sludge on physical and mechanical properties of gypsum fiber boards was significant to probability of 99%, in a way that maximum water absorption, maximum thickness swelling and minimum density of the boards for the treatment of 40:60 percent of gypsum to sludge was gained as follows in respect: 29.7%, 2.15 % and 0.66 g/cm³. On the other hand, MOR and MOE for board with gypsum: sludge ratio of 70:30 were gained 1.765MPa and 1.598 GPa, respectively. The effect of pressing time on physical properties of gypsum fiberboard was not significant at the probability of 95%. According to the obtained results, it has been suggested that such boards could be used in covering and ceiling isolating applications.

Keywords: DIP sludge, Gypsum fiberboard, Isolating application, Physical properties, Mechanical properties.

* Corresponding author, Email:Sh.Pourmoussa@gmail.com, Tel: +98 26 34183945