THE IIOAB JOURNAL

VOLUME 7 : NO 4 : DECEMBER 2016 : ISSN 0976-3104

Institute of Integrative Omics and Applied Biotechnology Journal

Dear Esteemed Readers, Authors, and Colleagues,

I hope this letter finds you in good health and high spirits. It is my distinct pleasure to address you as the Editor-in-Chief of Integrative Omics and Applied Biotechnology (IIOAB) Journal, a multidisciplinary scientific journal that has always placed a profound emphasis on nurturing the involvement of young scientists and championing the significance of an interdisciplinary approach.

At Integrative Omics and Applied Biotechnology (IIOAB) Journal, we firmly believe in the transformative power of science and innovation, and we recognize that it is the vigor and enthusiasm of young minds that often drive the most groundbreaking discoveries. We actively encourage students, early-career researchers, and scientists to submit their work and engage in meaningful discourse within the pages of our journal. We take pride in providing a platform for these emerging researchers to share their novel ideas and findings with the broader scientific community.

In today's rapidly evolving scientific landscape, it is increasingly evident that the challenges we face require a collaborative and interdisciplinary approach. The most complex problems demand a diverse set of perspectives and expertise. Integrative Omics and Applied Biotechnology (IIOAB) Journal has consistently promoted and celebrated this multidisciplinary ethos. We believe that by crossing traditional disciplinary boundaries, we can unlock new avenues for discovery, innovation, and progress. This philosophy has been at the heart of our journal's mission, and we remain dedicated to publishing research that exemplifies the power of interdisciplinary collaboration.

Our journal continues to serve as a hub for knowledge exchange, providing a platform for researchers from various fields to come together and share their insights, experiences, and research outcomes. The collaborative spirit within our community is truly inspiring, and I am immensely proud of the role that IIOAB journal plays in fostering such partnerships.

As we move forward, I encourage each and every one of you to continue supporting our mission. Whether you are a seasoned researcher, a young scientist embarking on your career, or a reader with a thirst for knowledge, your involvement in our journal is invaluable. By working together and embracing interdisciplinary perspectives, we can address the most pressing challenges facing humanity, from climate change and public health to technological advancements and social issues.

I would like to extend my gratitude to our authors, reviewers, editorial board members, and readers for their unwavering support. Your dedication is what makes IIOAB Journal the thriving scientific community it is today. Together, we will continue to explore the frontiers of knowledge and pioneer new approaches to solving the world's most complex problems.

Thank you for being a part of our journey, and for your commitment to advancing science through the pages of IIOAB Journal.

Yours sincerely,

Vasco Azevedo

Vasco Azevedo, Editor-in-Chief
Integrative Omics and Applied Biotechnology
(IIOAB) Journal

ISSN: 0976-3104
REGULAR ISSUE
Wilson et al.

THE IIOAB JOURNAL

RESEARCH ARTICLE OPEN ACCESS

BIOPRESERVATION OF VALUE ADDED MARINE FISHES UNDER DIFFERENT STORAGE CONDITIONS USING BACTERIOCIN FROM LACTOBACILLUS SP (AMETLAB27)

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ABSTRACT

In the present study, morphologically differed 30 strains of Lactobacillus sp. were isolated from curd sample using MRS agar medium and they were screened against seafood pathogens by agar well diffusion assay. Eight potential strains were selected based on their inhibitory activity and they were selected for bacteriocin production. Among the eight strains, the bacteriocin produced by AMETLAB27 strain has showed the maximum zone of inhibition against all the tested seafood borne pathogens that were under study. Thus, strain AMETLAB27 selected for mass scale production of bacteriocin in order to perform the preservation studies. Based on the biochemical characteristics the strain identified as Lactobacillus sp. The value added and commercially available fishes such as Lutjanus campechanus, Gerres subfasciatus and Sardina pilchardus were collected from Rayapuram landing centre, Chennai, Tamil Nadu, India and divided into two groups. One group of fishes were stored directly as control and the other group of fishes were dipped in cold distilled water containing the bacteriocin of Lactobacillus sp. (AMETLAB27) and both treatments were stored at different temperatures like –40C and –240C for 30 days and the microbial load assessed at different time intervals (1st, 8th , 16th and 24th day). The presence of pathogenic microbial load in both the treatments such as total heterotrophic bacteria (THB), Escherichia coli, Vibrio cholerae, Vibrio parahaemolytcus, Salmonella sp, Shigella sp and Listeria sp were assessed by using most probable number (MPN) technique with specific media. The results of the study indicated that, the microbial load has been reduced in the treatment which preserved with bacteriocin produced by Lactobacillus sp (AMETLAB27).

Received on: 18th-March-2015
Revised on: 20th-May-2015
Accepted on: 26th– June-2015
Published on: 8th –July-2015

KEY WORDS

Lactic acid bacteria; Bacteriocins; Seafood borne pathogens; Bio-preservation

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INTRODUCTION

Seafood is one of the most important constituent for maximum section of the consumers' diet worldwide and ranks the most widely consumed food after meat and poultry as staple animal protein foods. Especially fishes form a cheap source of protein. Presently seafood such as fishes and prawns are the most widely consumed foods [1]. Generally, seafood can be associated with many potential risks; especially fishes are highly susceptible to microbiological contamination due to many factors such as water quality, temperature, harvesting area, type of sediment, size and storage method [2]. Quality of seafood is the most important aspect, because of the increasing demand for its products in markets, the food processing industries fix a goal to provide safe, wholesome and acceptable food to the consumer which is devoid of harmful microorganisms [3]. The common ways of preservation are applying mild heat stress and the use of chemical preservatives in low concentration to prevent the spoilage of food by the outgrowth of food borne pathogenic bacteria. But these methods have many disadvantages as it may change the natural flavour, texture and nature of the food [4]. To overcome the above problem and to improve the safety of the food by controlling the microbial load without changing the quality of food many innovative technologies have been introduced [5]. One of the innovative technologies being followed to improve the safety of the food is Bio-preservation. Bacteriocins of Lactic acid bacteria are considered to be a safe bio-preservative, since they are assumed to be degraded by proteases in gastrointestinal tract [6]. Most of the probiotic strains produce antimicrobial substances such as lytic enzyme, hydrogen peroxide, organic acids & Bacteriocin [7]. In particular, Lactic acid bacteria will produce a wide range of products from low molecular weight compounds, such as hydrogen peroxide, carbon dioxide and diacetyl to high molecular weight compounds, such as bacteriocins [8]. Since these compounds exhibit antibacterial activity against various pathogenic bacteria including gram positive and gram negative [9], the bacteria which produce these substances are recognized as safe

THE IIOAB JOURNAL ISSN: 0976-3104

bio-preservative bacteria and also due to their inhibition by the production of bacteriocin like inhibitory substances (BLIS) [10,11]. Some bacteriocins are commercially used as natural bio-preservatives in several food industries. In this context, the study aimed to determine the effectiveness of Lactobacillus sp. and their bacteriocin in the preservation of economically important fishes such as, Northern Red Snapper (*Lutjanus campechanus*), Silver Belly Fish (*Gerres subfasciatus*) and European Pilchard (*Sardina pilchardus*) at different temperature storage conditions.

MATERIALS AND METHODS

Isolation of Lactobacillus sp

For the isolation of lactic acid bacteria 10ml of homemade curd sample added to 90ml of sterile distilled water and it serially diluted up to 10-6. From the dilutions such as 10-4, 10-5 and 10-6, 1ml of sample taken and spreaded over sterile deMan Ragosa and Sharpe (MRS) agar plates and incubated at room temperature for 48 hours. After the incubation period morphologically different colonies were selected and subcultured in MRS agar plates and stored for further study. The morphological nature and the biochemical characterization were studied for the bacterial isolates as colonial morphology is an important parameter for preliminary identification.

Isolation of Seafood pathogens

The sea food pathogens such as, *E. coli, Vibrio cholerae, Vibrio parahaemolyticus, Salmonella sp, Shigella sp and Listeria sp* were isolated from infected fish samples using specific media [5].

Antibacterial activity of Lactobacillus sp

To determine the antibacterial activity of all the isolated strains of *Lactobacillus* sp, they were tested against the six seafood borne pathogens (E. *coli, V.cholerae, V.parahaemolyticus, Salmonella sp, Shigella sp and Listeria* sp) using agar well diffusion assay where the pathogens were already swabbed on nutrient agar plates [12].

Extraction of bacteriocin

The strains of Lactobacillus sp. which showed the zone of inhibition (ZOI) against all the tested sea food pathogenic bacteria were subcultured individually in MRS agar plates. The strains were inoculated separately in 50 mL of MRS broth (pH 6.8). For the extraction of bacteriocin, all the culture supernatants were centrifuged at 6000 rpm for 30 minutes at 4°C. The cell free supernatant precipitated with ammonium sulphate (40% saturation) and kept for 2 h at 4°C, and later centrifuged at 10,000 rpm for 20 minutes. After centrifugation the precipitate obtained resuspended in 10 mL of 0.05 M potassium phosphate buffer (pH 7.0) [13].

Determination of bacteriocin activity

For the determination of the activity of the bacteriocin against the pathogens, the agar plates were swabbed with 100µl of the isolated pathogens after growing them in their respective broths. Once the plates were dried aseptically, 5 mm wells were bored using a sterile borer and about 10µl of the extracted bacteriocin poured into each well. Then the plates were incubated for 24 h at 37°C. After the incubation period the antimicrobial activity determined by measuring the diameter of the ZOI (Zone of inhibition) around the wells [13]. The strain that showed the maximum inhibition zone against the tested seafood borne pathogens inoculated in 1000 mL MRS broth (pH 6.8) for mass scale production of bacteriocin by following the aforesaid procedure.

Optimization of bacteriocin production

The factors like pH, temperature, salinity and substrate concentration which were expected to influence the production of bacteriocin by the selected strain optimized by using one parameter at a time method. To determine the growth conditions of the selected potential Lactobacillus sp strain, it inoculated in MRS medium at different pH (6.0, 6.5, 7.0, 7.5, 8.0), temperature (25°C, 30°C, 35°C, 40°C, 45°C), saline concentrations (1%, 1.5%, 2%, 2.5%, 3%), with different carbon sources at 3% (Lactose, Starch, Dextrose, Fructose, Sucrose) and nitrogen sources at 3% (Ammonium sulphate, Peptone, Beef extract, Ammonium nitrate, Sodium nitrate). The growth of Lactobacillus sp in the medium determined at every 6hrs by observing the OD at 520nm.

Determination of protein concentration and Molecular weight of the purified bacteriocin

The protein content of the bacteriocin was determined by Lowry's method using Bovine Serum Albumin as standard. The molecular weight of the bacteriocin determined by Sodium Dodecyl Sulphate Poly-Acrylamide Gel Electrophoresis

Lyophilisation of bacteriocin

THE IIOAB JOURNAL ISSN: 0976-3104

After dialysis the partially purified bacteriocin was lyophilized for 48 hours at -50˚C by using Freeze-dryer and it was stored at two different temperatures -4^{0}C and -24^{0}C in Eppendorf tubes for further use [14]. During the storage period the anti-bacterial effectiveness of lyophilized bacteriocin was determined by dissolving 0.1g of the dried sample in 1ml of distilled water. Sterile discs were dipped in the sample and placed on the nutrient agar plates where the pathogens were already swabbed. After 24 hours of incubation, the zone of inhibition around the discs measured and the activity of bacteriocin was determined.

Fish sample preparation and treatment

Fresh fish samples (Lutjanus campechanus, Gerres subfasciatus, Sardina pilchardus) shown in **Figure– 7, Figure– 8, Figure– 9** were collected from Rayapuram landing centre, Chennai, Tamil Nadu, India. The fishes were stored in icebox and brought to the laboratory within 1 hour. One group of the fish samples were stored directly and other group of the fish samples were dipped in cold distilled water containing bacteriocin produced by the strain, and both the treatments were packed in sterile polyethylene bags and stored at different temperatures at –4°C and –24°C. The fishes that were stored without bacteriocin treatment served as control.

Microbiological analysis

Fishes were taken randomly from both treatments at different time intervals (0th, 1st, 8th, 16th and 24th day) and homogenised using mortar and pestle. 10g of the sample was mixed in 90 ml of sterile distilled water and this suspension was serially diluted up to 10-4. For the analysis of Total Heterotrophic Bacteria (THB) pour plate method was followed by using Nutrient agar medium. For the isolation of *E.coli, Vibrio sp., Salmonella sp., Shigella sp.,* and *Listeria* sp., MPN technique was followed by using EMB agar, TCBS agar SS agar and PALCAM agar respectively.

RESULTS AND DISCUSSION

The In spite of the modern technologies, safety concepts and preservation techniques, the number of food borne illness is in rise and the safety of food is still an important public health issue to be noticed [1]. Hence bio-preservation is an emerging technique to the seafood industries where lactic acid bacteria is used as preservatives in food products and it will provide health benefits to the consumers [15].

Isolation of Lactic Acid Bacteria from curd sample

In this study morphologically differed 30 strains of Lactobacillus sp. were isolated and they were named as AMETLAB01 to A*coli*, *V. cholerae*, *V. parahaemolyticus*, *Salmonella* sp, *Shigella* sp and *Listeria* sMETLAB30. The morphological characteristics, biochemical characteristics and gram nature of the 30 bacterial colonies w *Lutjanus campechanus, Gerres subfasciatus* and *Sardina pilchardus* ere noted. To determine their antimicrobial activity, all the 30 strains were tested against 6 different seafood borne pathogens (E. *coli, V. cholerae, V. parahaemolyticus, Salmonella sp, Shigella sp and Listeria s*p) using agar well diffusion assay. Based on their zone of inhibition (ZOI), the eight strains namely AMETLAB01, AMETLAB02, AMETLAB03, AMETLAB07, AMETLAB09, AMETLAB27, AMETLAB28, AMETLAB29 which showed the maximum inhibitory activity against all the tested seafood pathogens were potentially selected for further study.

All these eight strains were taken for bacteriocin production to determine their bacteriocin activity against seafood pathogens. Among the eight strains the strains namely AMETLAB02, AMETLAB07 and AMETLAB27 that showed the maximum inhibitory activity towards all the tested pathogenic bacteria were again confirmed for the activity of their bacteriocin towards all the seafood pathogens and the strain AMETLAB27 was found to be more potential than the other strains. The phenotypic and biochemical tests were performed to identify that the strain (AMETLAB27) was Lactobacillus species [16]. The strain was found to be gram positive, non-motile, non-spore forming and rod shaped.

Optimization of the growth medium

In the present study the results has proved the possibility of using this strain as a bio-preservative. So, the potential Lactobacillus sp strain was taken for optimization using one parameter at a time method. The optimal growth conditions for bacteriocin production were found to be at pH 7, 25ºC, 1% salinity, starch-3% as carbon source, 3% beef extract as nitrogen source with 24hrs incubation. **Figure– 1, Figure– 2, Figure– 3, Figure– 4** and **Figure– 5** shows the representation of the optimal growth conditions (carbon source, nitrogen source, pH, temperature and salt concentrations). The strain AMETLAB27 was then grown in this optimised medium and the pure culture was preserved for future study. **Figure– 6** shows the pure culture of AMETLAB27.

THE IIOAB JOURNAL
ISSN: 0976-3104

Determination of protein concentration, molecular weight and lyophilisation

The potential strain of Lactobacillus sp was mass cultured in the optimized medium and the thus produced bacteriocin was partially purified by ammonium sulphate precipitation and dialysis. The total protein in the purified bacteriocin was determined as 0.43mg/ml by Lowry's method and two prominent bands were found in the SDS gel which corresponds to the molecular weight of 39KDa and 10KDa by SDS-PAGE analysis. After dialysis the partially purified bacteriocin was lyophilized for 48 hours at -50^{0}C by using Freeze-dryer and it was stored at two different temperatures -4^{0}C and -24^{0}C and its antibacterial effectiveness was found to be higher when stored at -24^{0}C.

Microbiological analysis

While preserving the value added and commercially available marine fishes (*Lutjanus campechanus*, *Gerres subfasciatus* and *Sardina pilchardus*) using the bacteriocin of Lactobacillus sp under two different temperature conditions, the microbial load in the fish samples preserved with bacteriocin was found to have reduced comparatively than the ones stored as control (preserved without bacteriocin). When the number of THB load during the preservation period was observed, it was found higher in number in the directly preserved fish sample (control) than in the samples treated with bacteriocin at both temperature conditions. This confirms that the growth of THB in the fishes has been eliminated by the bacteriocin of Lactobacillus sp (AMETLAB27) and also the bacteriocin from this particular strain can be used as a Bio-preservative in food processing industries.

Earlier it was cited that the antibacterial activity of Lactic acid bacteria was due to the production of metabolites like organic acids with low pH, hydrogen peroxide and bacteriocins [17-19]. The activity of the bacteriocins is greatly influenced by the organic acids and their salts. While reviewing another paper it was understood that these antimicrobial properties may be owing to the fact that the undissociated lactic acid molecules have a pH below the level at which the growth of many bacteria can be eliminated [20]. Other bacteriocins of Lactobacilli have been described to be potential against closely related species of mesophilic *Lactobacillus* and are considered as potential natural food preservatives [21].

E. coli load was totally reduced in bacteriocin treated fish samples comparing to the directly preserved fishes and the reduction in the growth of *E. coli* is due to the effectiveness of the bacteriocin from *Lactobacillus* sp. (AMETLAB27).

The presence of V. cholerae and V. parahaemolyticus was reduced in fish samples treated with bacteriocin from 8th day onwards in both the temperature conditions. The growth of Salmonella sp was also reduced completely from the 16th day onwards in the fish samples. But it was reported that the strains *of Lactobacillus* sp. has not inhibited the Salmonella sp. in meat products [22]. In our study, we incurred that there were no occurrence of Shigella sp and Listeria sp from 8th day onwards in the samples treated with bacteriocin at both temperature conditions.

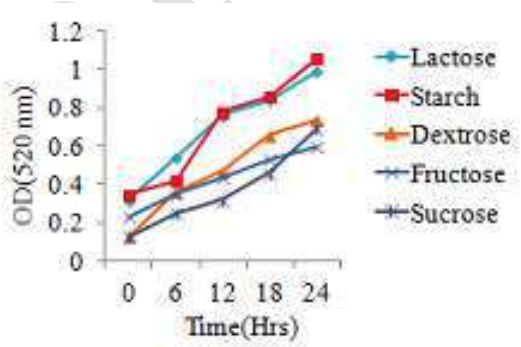

Fig: 1. Effect of carbon source on the growth of Lactobacillus sp (AMETLAB27)

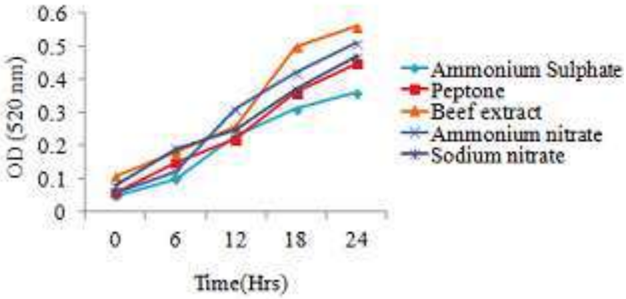

Fig: 2: Effect of nitrogen source on the growth of Lactobacillus sp (AMETLAB27)

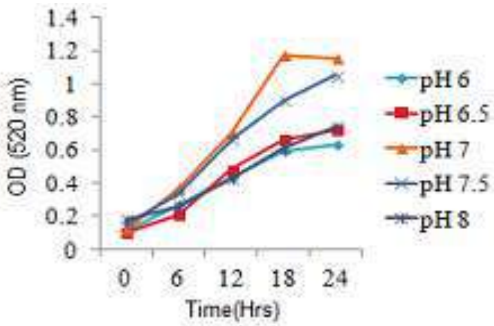

Fig: 3. Effect of pH on the growth of Lactobacillus sp (AMETLAB27)

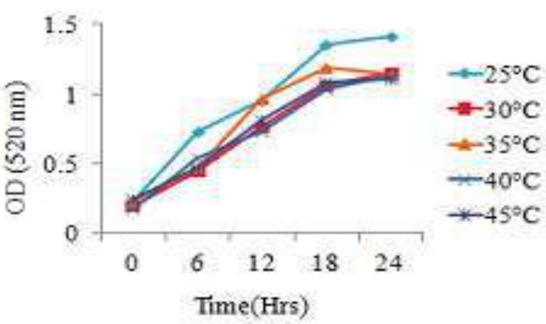

Fig: 4. Effect of temperature on the growth of Lactobacillus sp (AMETLAB27)

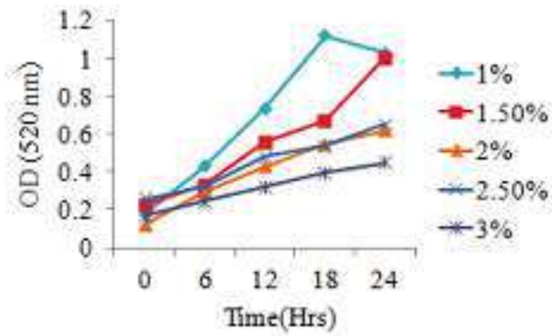

Fig: 5. Effect of various salt concentrations on the growth of Lactobacillus sp (AMETLAB27)

Fig: 6. Pure culture of Lactobacillus sp (AMETLAB27)

Fig: 7. Lutjanus campechanus **Fig: 8. Gerres subfasciatus** **Fig: 9. Sardina pilchardus**...

THE IIOAB JOURNAL
ISSN: 0976-3104

CONCLUSION

From the results, the work emphasised the elimination of microbial load from the fish samples treated with bacteriocin produced from Lactobacillus sp (AMETLAB27) preserved at -40C and -240C. This study revealed that the strain *of Lactobacillus* sp (AMETLAB27) is a potential strain and their bacteriocins were efficient against seafood borne pathogens and the usefulness of them as a bio-preservative as it has antimicrobial effects on some clinically important food borne pathogens. The bacteriocins produced by gram positive bacteria especially lactic acid bacteria display a proper broad inhibitory spectrum with food preservative and therapeutic potentials. This confirmed the possibility of using the strain as a bio-preservative in fish processing industries. This exposes that the bacteriocin produced by *Lactobacillus* sp (AMETLAB27) can be applied as a defensive culture for the enhancement of the microbial safety of fermented foods and reduction in food contamination that caused various disorders and illness to the human beings in the near future.

CONFLICT OF INTEREST

There is no any form of conflict of interest

ACKNOWLEDGEMENT

None.

FINANCIAL DISCLOSURE

No financial sponsor in the form of person, institution or organization is involved in the present work

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ISSN: 0976-3104
REGULAR ISSUE
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THE IIOAB JOURNAL

ARTICLE OPEN ACCESS

STUDY AND APPLICATION OF DYNAMIC INCREMENTAL REGRESSION IN SEASONAL CROP MARKETING SUPPORTED BY SONN

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ABSTRACT

Seasonal crop Marketing includes market infrastructure modeling, providence of crop market information and multi level conservatory, advisory, training services through synchronized networks. In modern world it became challenging with the most recent technologies and association of commission agents who keep their margins and move the produce further. In the through course of action of marketing the farmer gets the lowest price and the ultimate consumer pays the premier as the association of more agents in the entire supply chain process. To benefit the farming community the internal crop marketing network in the nation needs to be incorporated and strengthened. Internet can be effectively used to strengthen the supply, marketing chain for agro based companies leading to better price realization by farmers. It enables all outputs of farming to customers at sensible price without compromising on the quality of the produce. Here a novel ensemble model of incremental approach of regression associated with Self Organized Neural Network (SONN) clustering is proposed that helps farmers in decision making of agricultural goods based on real time and equipped marketing information in domain of agricultural networked channel pattern. The model was tested against vellore district crop data and proved better performance against conventional prediction methods.

Received on: 07th-Jan-2015
Revised on: 16h-Feb-2016
Accepted on: 19th-Feb-2016
Published on: 20th-Apr-2016

KEY WORDS

Agricultural marketing, Incremental Regression, Neural Networks, Prediction

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INTRODUCTION

The mounting trend of agricultural production has invoked new challenges in terms of finding market for the marketed surplus. The changing global agricultural scenario insists the need to review the policies related to pricing, marketing and trading of agricultural commodities. Agricultural marketing reforms and creation of marketing infrastructure has been initiated to respond to the market needs and consumer preferences. The exploitation of intermediaries and traders prevented farmers to ensure better prices and timely payment for their produce. Exporters, processors and retail chain suppliers cannot obtain straight from the farmers as the produce is required to be channelized through regulated markets and licensed traders.

Agricultural Market network is set of cooperatives at the local, regional, state and national levels .If the seasonal crop production is enomorous it ends up in low price for product. But if the same product is transported to another market where there is market need and consumer preference considerable profit could be achieved. At present scenario it is impossible to know the market information of products from a single place. In agricultural sector the amplified marketing information flow has a positive effect in decision making but, collecting and disseminating information is often complicated and expensive. Data mining techniques has a great deal of interest in recent years that increases the amount of marketing data provided to all participants, decreases the cost of disseminating the information and facilitates collected information for better price realization.

Forecasting the price movements is a major issue in confronting producers, brokers and sellers. Automatic learning systems create extensible data-driven applications by inferring the appearance and behavior of data entities at run time from the database. These rule based technologies concentrate in static data which are less successful. The proposed dynamic marketing extraction using SONN increases the accuracy of precipitation in forecasting of predicting prices in agricultural products wholesale markets.

LITERATURE SURVEY

Agriland – Nellikuppam, Tamil Nadu project includes upgrade market and commercial information among farmers, train farmers on the latest developments in agricultural technology, provide access to farmers to the precise markets through reasonable credit and transportation solutions and to support farmers in raising their income in triple means

THE IIOAB JOURNAL
ISSN: 0976-3104

in next five years. Agmarket scheme provides funds to state and national level institutions managing the markets and executing market-led expansion activities and thus has no distinct gender specific provisions under the scheme. It covers market, price, infrastructure and advertising related data for proficient marketing. The designed system uses a quadratic forecasting model of linear time series to forecast the cost, and compares the prediction results by using different time series and different training data to identify the best prediction model to foretell the price in sites [1]. A study of the ASD-DM Methodology [2] helps arrive at an understanding of the need and relevance of dynamic and agile methods of software engineering in data mining procedures. [3] Lists out applications that evaluate different data mining techniques for their accuracy in predicting the default credit payments thereby giving more insight into the performance abilities of various predictive data mining techniques. [4] wherein describes a direct and an iterative forecast method of prediction using neural networks that is highly relevant to this work. In [5], various regression techniques such as the Ordinary Least Squares (OLS), Principal Component Regression (PCR) and Latent Root Regression (LRR) methods are defined and their relevance due to shelf life prediction is discussed. [8] Applies data mining techniques to categorize the momentous variables that measure network intrusion from the wealth of raw network data and perform competent susceptible assessment based on those variables. [10] Deals with appropriate regression techniques and compares four diverse techniques on selected agriculture data. [11] selects significant patterns for the effective prediction of heart attack using Multi-layer Perceptron Neural Network with Back-propagation as the training algorithm.[12] states that statistical and forecast analyses on data sets refers the growth of olive fly by present characteristics (big variability and non-linearity) which makes complex to be treated mathematically. According to [14] ANNs are useful when data are unsupervised because they can discover from the data. ANNs, however, do not provide a clean model to a problem. It is hard to know how they come to their conclusions, because they are like a "black box", only providing a final outcome and not what causes the result. Textual articles appearing in the leading and influential financial newspapers are taken as input by [15].Then the daily closing values of major stock market indices in developed countries are predicted. Textual sentences describe not only the cause but also the reason behind it. Exploring textual information in addition to numeric time series data improves the eminence of the input. From the background study it is clear that the statistical and data mining techniques is applicable on datasets of reasonable size. But in practical, the increasing size of datum deviates the prediction accuracy. Hence our paper aims in extracting the user defined crop price datum by SONN clustering followed by incremental linear regression that showcases improved accuracy.

MATERIALS AND METHODS

The proposed system extracts market data table from online pages. It detects the RSS Feed or "<td>" " <tr>" tags on web pages and transforms it into DOM tree, Further obtains the node values of the "<td>" tags by defining the extraction rules and stored in the database which is given as input to the knowledge extraction engine. The transformed data are preprocessed into the format required for the storage of the data that includes procedures to deal with null values and outliers. Marketing analysts may wish to categorize a group of agricultural commodities to buy, sell, or hold. Neural networks technology is widely used to cluster such quite complex and numerous irrelated variables. SONN are interconnected networks of sovereign processors that, by changing their associations (known as training), discover data in clusters. The incremental linear regression of cost runs to update the regression coefficients when the target data of regression is available. This process operates parallel with the stored data to economize on the number of database accesses**.** The Price forecasting process is a complex system that contains many uncertain factors, it is hardly exactly speaking that it is merely a linear or nonlinear system. Therefore, the modeling of precipitation forecasting should contain some linear and nonlinear characteristics.

Extraction of online dynamic crop prices using DOM

Online websites provides publicly accessible contents as RSS Feed (Really Simple Syndication) for data analysts. RSS immediately publishes regularly updated contents (*i.e.*, price information) in generalized (XML) format [13]. The following algorithm filters the featured price from web pages/RSS using DOM (Domain object model).

1. Achieve the web page of an appointed URL
2. Convert pages into XML and convert into DOM tree
3. Define extraction rules and identify data block using XPATH
4. Extract table using DOM or SAX or Regular Expression
5. Store Extracted data into database

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ISSN: 0976-3104

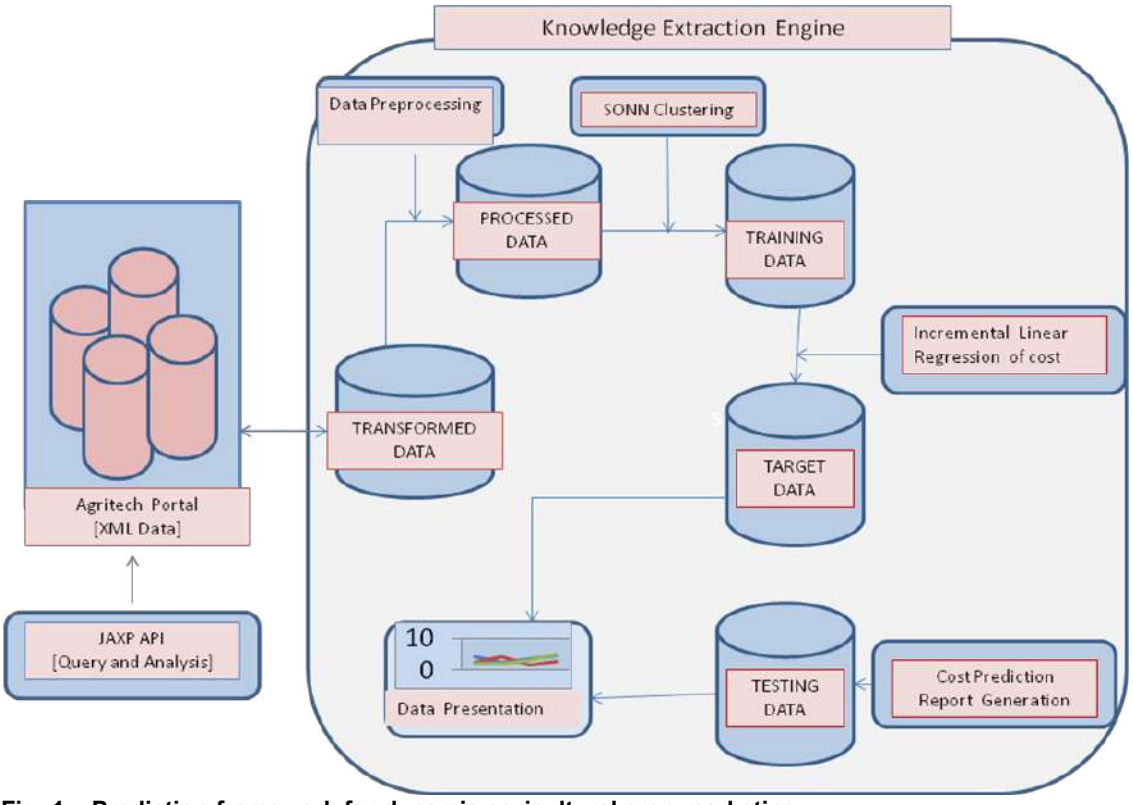

Fig: 1. Prediction framework for dynamic agricultural crop marketing

SONN clustering for specific crop and market categorization

Clustering is a process of unsupervised learning which aims at discovering new set of physical or abstract objects into reference set of classes. The cluster has the characteristics of more similarity within the group and is described as unsupervised learning of a concealed data concept. Let the set of n points $\{x_1, x_2, \ldots, x_n\}$ be represented by the set S and the K clusters be represented by $C_1, C_2, \ldots, C_K$. Then

$$C_i \neq \phi \qquad for i = 1,\ldots..,k,$$

$$C_i \cap C_j = \phi \qquad for \qquad i = 1,\ldots..k, j = 1,\ldots..,k \qquad and \qquad i \neq j$$

$$and \bigcup_{i=1}^{k} c_i = s$$

In SONN an input pattern has n features and is represented by a vector x in an n-dimensional pattern space. The network links the input training set to an output pattern. The output space is supposed to be a 1-dimensional or 2-dimensional array of output nodes. The neurons are connected like a lattice, usually a one or two-dimensional array, which is placed in the input set and is linked over the inputs distribution. To each processing unit in the SONN lattice is associated as similar dimension input vectors. Using the weights of each processing unit as a set of coordinates the lattice can be positioned in the input space. During the learning stage the weights of the units change their position and "move" towards the input points. When the map is visualized the inputs can be associated to each cell on the map. The cells closely contains similar values can be considered as a cluster on the map. These clusters are formed during the training phase using the available data.

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Table :1. Sample Clustered crop price from online RSS Feed [Data courtesy http://www.agmarket.nic.in]

Market	Date	Variety	Modal price	Max price	Min price
Ammoor	1/2/2013	ADT 37	1553	1747	1650
Ammoor	2/4/2015	ADT 36	1639	1671	1655
Ammoor	2/5/2010	ADT 36	1639	1671	1655
Ammoor	4/6/2011	ADT 36	1675	1672	1672
Ammoor	4/8/2015	BPT	1015	1105.54	1978
Ammoor	4/7/2012	Other	915.03	1882.46	1810
Ammoor	3/9/2014	A. Ponni	1625	1684	1480

Incremental approach based marketing price prediction

The mathematical formulation for the best-fitting curve to a given set of points by minimizing the sum of the squares of the offsets of the points from the curve is known as least squares fitting technique. Assume that $\{x_i, y_i , i = 1, 2, \cdots, n\}$ are independent bivariate observations from the pair of response–explanatory variables {X, Y }, To describe the relationship between Y and X, a typical regression model is described by

$$E(Y/X) = \mu_0 + \mu_1 x \quad (1)$$

where the intercept μ_0 and μ_1 the slope are unknown regression coefficients. We assume that each observation, Y, can be described by the model

$$Y = \mu_0 + \mu_1 x + \varepsilon \quad (2)$$

Where ε is a random error with mean zero and (unknown) variance σ2. The random errors corresponding to different observations are assumed to be uncorrelated random variables.

The estimates of μ_0 and μ_1 should result in a line that is a best fit to the data. One way to find the values of μ_0 and μ_1 is to minimize the sum of squares of the vertical deviations from the estimated regression line. This criterion is known as the method of least squares. Suppose that we have *n* pairs of observations: (x_1, y_1), $(x_2, y_2) \ldots\ldots (x_n, y_n)$.Using equation(1), we may express the *n* observations in the sample as:

$Y_i = \mu_0 + \mu_1 x_i + \varepsilon_i$ i=1,2,…….n

and the sum of the squares of the deviations of the observations from the true regression line is:

$$L = \sum_{i=1}^{n} \varepsilon_i^{\,2} = \sum_{i=1}^{n} (y_i - \mu_0 - \mu_1 x_i)^2 \quad (3)$$

The least square estimators of μ_0 and μ_1, say $\hat{\mu}_0$ and $\hat{\mu}_1$ must satisfy

$$\frac{\partial L}{\partial \mu_0}_{\hat{\mu}_0, \hat{\mu}_1} = -2\sum_{i=1}^{n} (y_i - \hat{\mu}_0 - \hat{\mu}_1 x_i) = 0 \quad (4)$$

$$\frac{\partial L}{\partial \mu 0}_{\hat{\mu}_0, \hat{\mu}_1} = -2\sum_{i=1}^{n} (y_i - \hat{\mu}_0 - \hat{\mu}_1 x_i) = 0 \quad (5)$$

Simplifying equations (4) and (5), we get,

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$$n\hat{\mu}_0 + \hat{\mu}_1 \sum_{i=1}^{n} x_i = \sum_{i=1}^{n} y_i \quad (6)$$

$$\hat{\mu}_0 \sum_{i=1}^{n} x_i + \hat{\mu}_1 \sum_{i=1}^{n} x_i^{\,2} = \sum_{i=1}^{n} y_i x_i \quad (7)$$

Equations (6) and (7) are called the least squares normal equations. The solution to the normal equations result in the least square estimators $\hat{\mu}_0$ and $\hat{\mu}_1$. These values are the same as the values in equations (17) and (18) with slight difference in the form of the equation.

$$\hat{\mu}_1 = \frac{\sum_{i=1}^{n} y_i x_i - \frac{(\sum_{i=1}^{n} y_i)(\sum_{i=1}^{n} x_i)}{n}}{\sum_{i=1}^{n} x_i^{\,2} - \frac{(\sum_{i=1}^{n} x_i)^2}{n}} \quad (8)$$

$$\hat{\mu}_0 = \bar{y} - \mu\hat{1}\bar{x} \quad (9)$$

where $\bar{x}$ is the average of $x_1, x_2, \ldots, x_n$, and $\bar{y}$ is the average of $y_1, y_2, \ldots, y_n$.
In estimating the regression coefficients one can make use of the equations (8) and (9). Along with the values of regression coefficients being stored in the database, one can also store the values of $\sum_{i=1}^{n} y_i x_i$ $\sum_{i=1}^{n} y_i$, $\sum_{i=1}^{n} x_i$, $\sum_{i=1}^{n} x_i^2$ and n. With this while new data is being inserted into the database, the above mentioned values can be updated with minimum number of mathematical operations. For example, if a new entry into the records is made with the value (x_{n+1}, y_{n+1}), only the following few operations will be needed thereby reducing the complexity by a large amount:
n=n+1

$$\sum_{i=1}^{n+1} y_i x_i = \sum_{i=1}^{n} y_i x_i + y_{n+1} x_{n+1} \quad (10)$$

$$\sum_{i=1}^{n+1} y_i = \sum_{i=1}^{n} y_i + y_{n+1} \quad (11)$$

$$\sum_{i=1}^{n+1} x_i = \sum_{i=1}^{n} x_i + x_{n+1} \quad (12)$$

$$\sum_{i=1}^{n} x_i^2 = \sum_{i=1}^{n} x_i^2 + x_{n+1}^2 \quad (13)$$

This process would just need 2 multiplication and 5 addition operations thus reducing the computation time by a great amount. Also, the regression coefficient values can be calculated in parallel with data updation. The only overhead in this method is the memory space needed to store the extra information

RESULTS

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The experimental analysis in finding significant price for specific crop prediction results are presented in this section. The Agricultural marketing data set is preprocessed successfully by removing duplicate records and supplying unknown values. The obtained data set, resulting from preprocessing, is then clustered using SONN clustering via CMSR - Cramer Modeling Segmentation & Rules. The crop prices dataset we have used for our experiments is obtained from Agritech portal of Tamilnadu agricultural University. With the help of the dataset, the appropriate crop price predictions are extracted using the proposed approach. The training data include the location based separated price data from 2010-2014, is tested against the year 2015 and comparative results are introduced in **Table I**. In **Fiure 2**, the upshot of the model and its results are graphically represented.

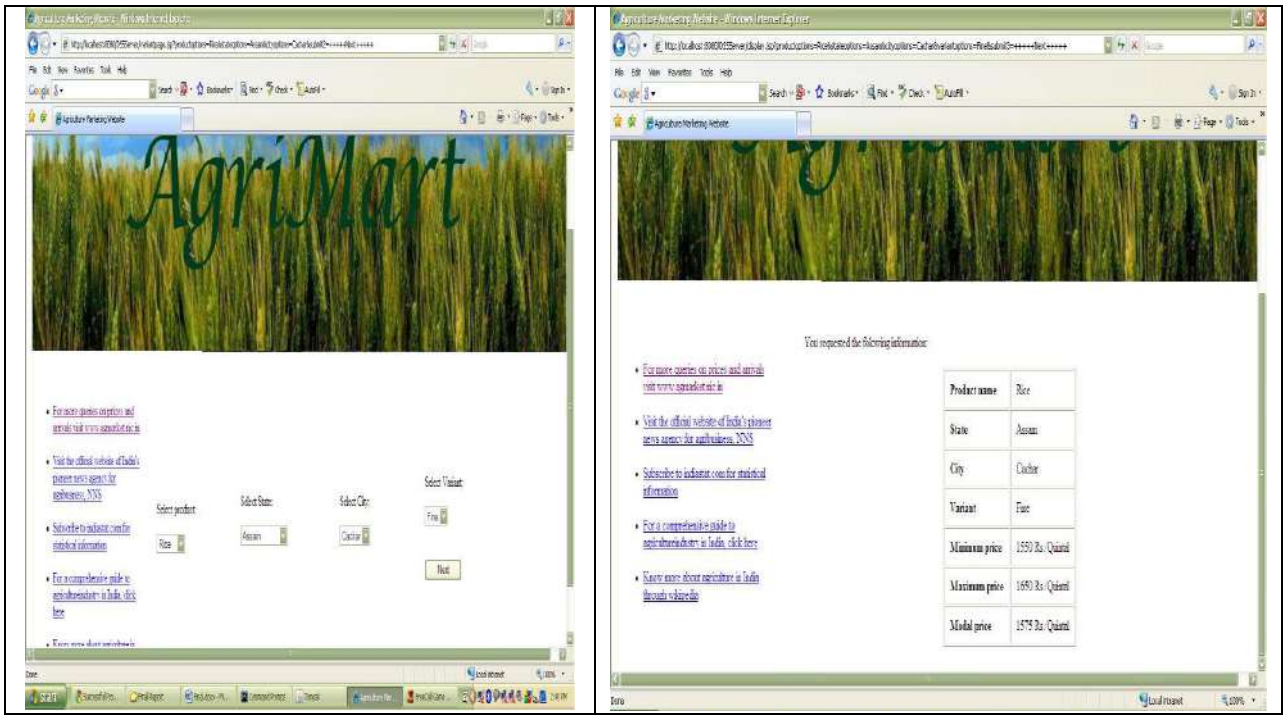

Fig: 2. Predicted modal price for user specified crop from online RSS Feed

The proposed algorithm works in two basic phases. The first phase involves the extraction of desired market data to determine user specified crop price with respect to the number of data set supplied. The second phase is the prediction of crop agricultural prices for marketing. For experimental purpose we randomly divided the target data set into two groups called training dataset (90%) and testing(unknown)dataset (10%) .Before executing, data cleaning and pre processing are performed. The training dataset is used to build the knowledge mining model and the testing dataset is used to detect over fitting of the rules based on the threshold decided by the domain intelligent system. In order to validate our approach we have compared it with some conventional decision making algorithms and the results are shown in **Table– 2 and 3**.

The cause and effect relationship of marketing demand for user specified crop variety with respect to the total demand in the Indian marketing committees was analyzed using incremental linear regression statistical technique and the results are tabulated **Figure– 3**.

Table: 2. Predicted prices of various products [Ammoor market of Vellore district]

Product	Variant	Projected Min (No. of Days)	Projected Max (No. of Days)
Rice	B P T	1917 (1), 1929 (2)	2120 (1), 2107 (2)
Rice	ADT 37	1899 (1), 1898 (2)	1899 (1), 1898 (2)

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ISSN: 0976-3104

Rice	ADT 36	991 (1), 996 (2)	1017 (1), 1018 (2)
Rice	ADT 36	1017 (1), 1086 (2)	1113 (1), 1117(2)
Rice	Co 43	1056 (1), 1066 (2)	1056 (1), 1064 (2)
Rice	A. Ponni	1063 (1), 1070 (2)	1063 (1), 1070 (2)

Table: 3.Accuracy of predicted prices of various products

Actual Min (No. of Days)	Actual Max (No. of Days)	Accuracy % (Min)	Accuracy % (Max)	Number of Records
1950 (1)	2000 (1)	98.28%	94.34%	50
1900 (1)	1900 (1)	99.94%	99.94%	4
1081 (1), 1081 (2)	1092 (1), 1086 (2)	90.91%,91.46%	92.62%,93.32%	18
1200 (1), 1100 (2)	1300 (1), 1200 (2)	82.01%,98.71%	83.19%,92.57%	12
1081 (1)	1095 (1)	97.30%	96.31%	6
950 (1)	1300 (1)	89.37%	77.74%	5

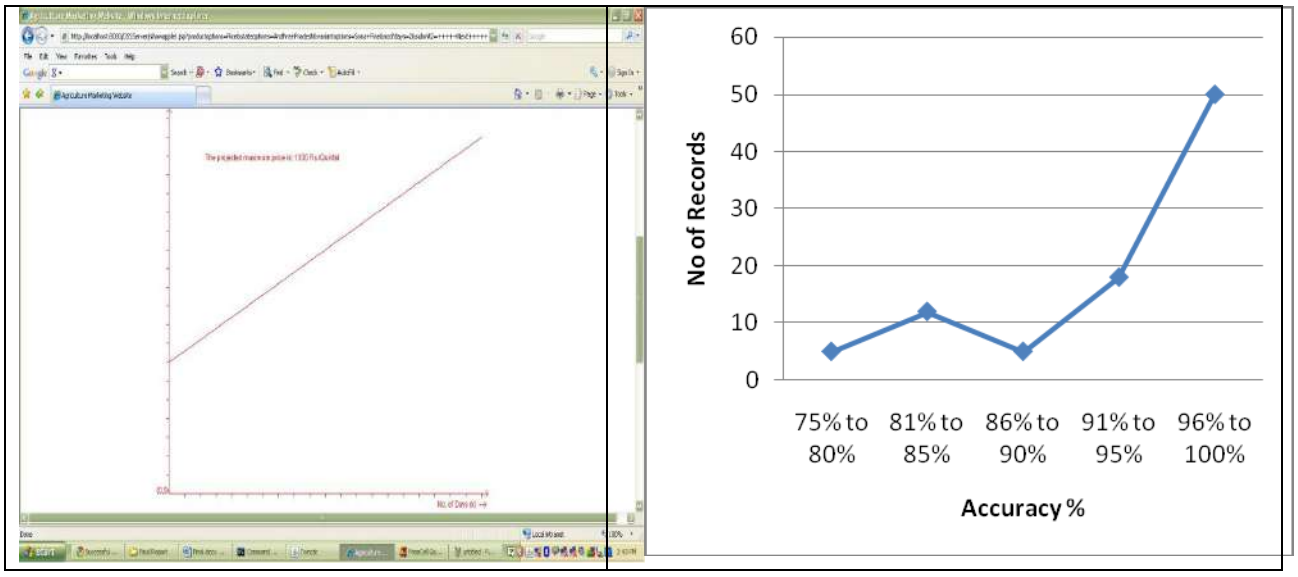

Fig: 3. Plot of accuracy against dataset size

CONCLUSION

The proposed decision support system fetches recent-most prices of regional agricultural products from various web based RSS feeds and analyses the price trend by incremental predictive data mining technique. An increase in the amount of testing data to compute regression coefficient, more is the efficiency of the predicted values. In the commercially available prediction data mining tools all collected data is used recursively to find out the regression coefficients. But this approach has increasing computation complexity and the number of mathematical operations needed to calculate the coefficients. But incremental approach for computing the regression coefficients increases the system's predicting ability and accuracy. This model can be enhanced by incorporating the use of stock availability and demand values for the agriculture products in the process of regression analysis.

CONFLICT OF INTEREST

The author declares having no competing interests.

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ISSN: 0976-3104

ACKNOWLEDGEMENT

None.

FINANCIAL DISCLOSURE

Institutional support was received.

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ISSN: 0976-3104
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ARTICLE OPEN ACCESS

COMPARISON BETWEEN ABOVE- AND BELOW-GROUND BIOMASS AND CARBON STOCKS OF *QUERCUS BRANTII* IN CENTRAL AND SOUTH ZAGROSIAN FORESTS

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ABSTRACT

In this study, we analyzed the above- and below-ground biomass and carbon storage data for 36 trees with diameter ≥5 cm from central and south Zagrosian Forest in Iran. The aim of this research was to estimate the carbon stocks of above- and below-ground biomass in the Zagrosian forest of west Iran. Although Persian oak (Quercus brantii Lindl.) comprises more that 90% of the Zagrosian forests and similarly a major chunk of its woody biomass storage, however the scientific papers about the extent of its above- and below-ground biomass storage per tree and stand are rare. The current study examined proportion of biomass and carbon sequestration quantity in the scale of individual tree, stand and the growing forms, which were: coppice and high-forest. The methodology of harvesting was used to measure the carbon stock of this natural forests. Amount of biomass stored by above- and below-ground per tree which were 252.77, 181.36 for high forest trees and 217.7, 191.02 kg for coppice respectively in central Zagrosian forests (CZF). But this ratio which were 227.77, 170.45 for high forest trees and 197.99, 167.24 kg for coppice respectively in south Zagrosian forests (SZF). Also, the results of this study showed that the average carbon stock in CZF was 26.85 tonnes C /ha for sum above- and below-ground biomass and 21.08 tonnes C /ha for SZF respectively.

Received on: 10th-March-2016
Revised on: 18th-April-2016
Accepted on: 26th–April-2016
Published on: 8th –May-2016

KEY WORDS

phalograph (Biomass, Carbon stocks, Quercus brantii, Zagrosian forests

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INTRODUCTION

In recent years, the estimation of forest carbon stocks has gained prominence due to the role of forests in the mitigation of global climate change through carbon storage in biomass and soil. Estimates of carbon (C) stocks and stock changes in tree biomass (above- and belowground) are required for reporting to the United Nations Framework Convention on Climate Change (UNFCCC) and will be required for Kyoto Protocol (KP) reporting. The Intergovernmental Panel for Climate Change has recently published Good Practice Guidance (IPCC GPG) for the reporting of land use, land use change and forestry activities [1].

This guidance highlights the importance of nationally specific information, regarding a country's forest resources, in order to increase the transparency and verifiability of national C inventories. For countries which have significant amounts of afforestation, deforestation and reforestation, nationally specific information that can be used in the development of C stock and stock change estimates will greatly enhance the quality of greenhouse gas (GHG) reporting to the UNFCCC and its KP. Human activities for reducing atmospheric CO_2 were started when the effects of global warming were specified. After ratification of the Kyoto Protocol, two different actions have been taken for reducing CO_2 emissions: reducing human activities related to greenhouse gas emission; creating and improving carbon sinks in the biosphere by tree plantation [2, 3]. Trees play an important role in reducing CO_2 by absorbing and accumulating it in their leaves, branches, stems and roots as biomass [4]. Biomass has been widely used for carbon cycle studies because it is an important indicator of vegetation growth and dynamic [5]. Forest managers are interested in increasing the productivity of the planted forests and the timber production which accordingly can increase the carbon sequestration rates [6, 7].

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ISSN: 0976-3104

The estimation of aboveground biomass (AGB) is necessary for studying productivity, carbon cycles, nutrient allocation, and fuel accumulation in terrestrial ecosystems [8]. Biomass estimates take into account the differences in wood density, upper stem dimensions and crown morphology [9].

Oak is a dominant tree species in various types of forest including temperate, subtropical and tropical as well as in some areas of chaparral and scrubland [10]. Persian oak (Quercus brantii Lindl.) covers most of the Zagrosian forests throughout three countries. Its versatile growing forms allow it to be seen in both high-forest and coppice forms in a single site [11]. Trees affected by anthropic activities, trend to grow in coppice form, which comprises more than 80 percent of these forests. This phenotypic plasticity gives in situ observers an opportunity to compare the root-shoot ratio between two growing forms of the Persian oak trees in different tree ages and sizes.

The potential of oak species to reproduce vegetatively, the fact that they frequently have been cut and harvested for many years, and the particular ecological and edaphic conditions in these ecosystems, are the main causes for the domination of coppice stands in the zagros zone.

In this research, we aimed to compare the biomass and carbon storage potential in the above- and below-ground parts of *Quercus brantii* in the two Persian oak growing forms located in central and south Zagrosian forest in west of Iran.

MATERIALS AND METHODS

The study was conducted at a forest in Basht city, Kohgiluyeh and Boyer-Ahmad Province, in south-western of Iran. We selected one of the least disturbed southest Zagrosian forest stands, with the local name of Dahak mountain (30°21'-30°50'N, 50°25'-51°20'E). With an average altitude of 835 m, annual temperature of 26°C and precipitation of 634 mm, the site is categorized as a semi-dry temperate region based on the bioclimatic Emberger's method. The oak forest is located on a silty clay deep brown forest soil with pH 7.87. Persian oak (*Quercus brantii* Lindl.) with almost 90% forest cover is the dominant tree species, creating a vast park-like landscape. Several hawthorn and wild almond species are the companion shrubs and trees. For second area, we selected one of the least disturbed central Zagrosian forest stands, located at the head of the Karoon River, with the local name of Balootboland (31°20'-31°50'N, 49°25'-50°20'W). With an average altitude of 1641 m, annual temperature of 24°C and precipitation of 694 mm, the site is categorized as a semi-dry temperate region based on the bioclimatic Emberger's method. The oak forest is located on a silty clay deep brown forest soil with pH 8.1.

In late spring 2015, and at the same altitude and facing slope, For each area eighteen healthy Persian oak trees were chosen (9 trees of each high-forest and coppice growing forms), in a way that each diameter at breast height (DBH) class for high-forest trees, and crown width (CW) class for coppice trees, had a representative in our selection. The selected trees were cut down and their trunk were detached. In a coppice tree, trunk was limited to the lower part of the tree crown; and in a high-forest tree, it extended across the crown until it couldn't be distinguished [**Figure– 1**]. 30 circular plots were systematically placed at each study site to measure diameter at ground level. The size of sample plots were limited to either 1500 m^2 (radius: 21.85) for measured trees per hectare.

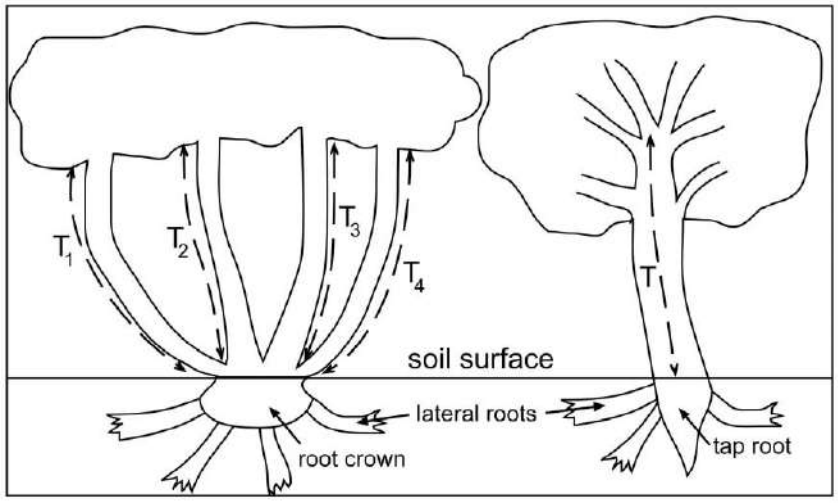

Fig:1. Differences between two Persian oak growing forms. Having several shoots or trunks (T1-T4 in this case) and existence of a major root crown are the characteristic features of a coppice tree (left), and standing on a single trunk (T) as well as a prominent tap root are associated with a high-forest tree. Refer to the text for further details about the meaning of the trunk in this study.

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Tree crown defoliated manually (foliage) and trunks and major branches were debarked. Small branches with leaf scar (twigs) were also dissected. A CAT excavator was used to create a hole as wide as tree crown peripheral. Stump and all attached underground woody organs (roots) were exhumed and cleaned. The biomass for stump was added to the trunk biomass.

Fresh weight of roots, foliage, twigs, branches (big and small together) and trunks were measured using a battery-powered bascule at the tree location. An appropriate sample size from each above mentioned tree components were stored in a sealed container. These samples were later dried to constant weight at 80°C in lab. The moisture content percentages were then used to calculate the biomass weight for each tree part. A considerable portion from each tree part was also moved to the lab and its total organic carbon was analyzed using the combustion method [12].

One-way analysis of variances was used to test the significant differences in biomass and carbon concentration between different tree parts. A Tukey test were applied to identify significant differences ($P < 0.05$).

RESULTS

Central Zagrosian forests

Figure– 2 shows the amount of the ecosystem trees per hectar from two growing forms of the Dehdez stands. The number of trees per hectar in high forest form which were 66.88 and 62.88 for coppice respectively.

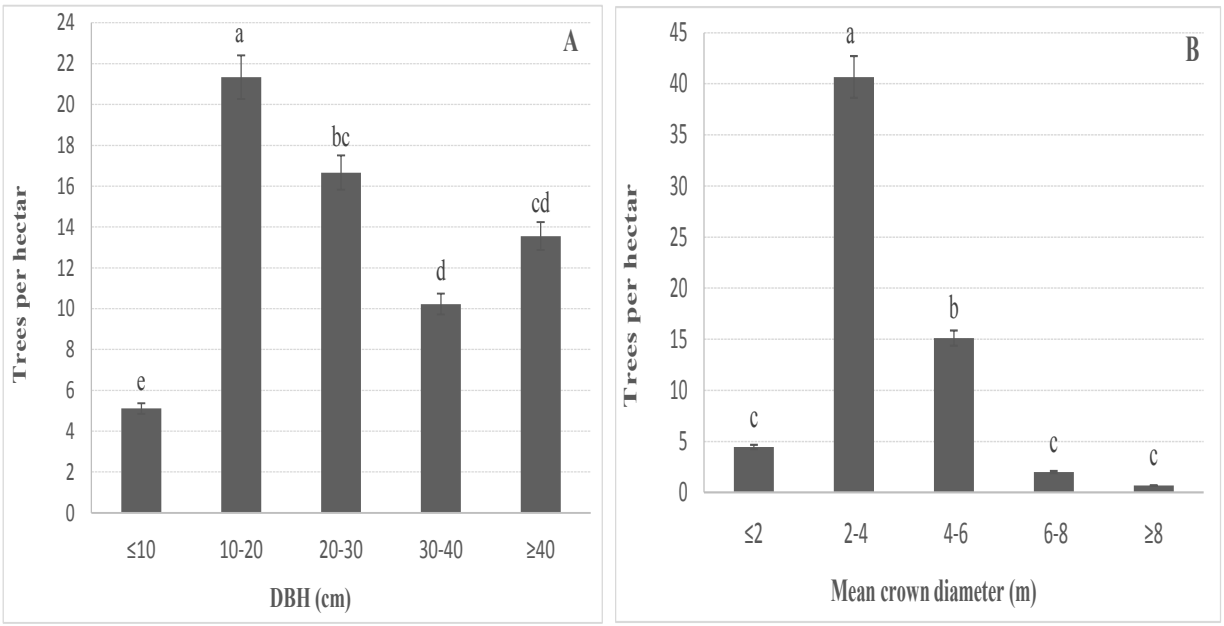

Fig: 2. The average number of trees per hectare in different diameter classes; high forest (A) and coppice (B) trees

Figure– 3 shows the amount of the ecosystem biomass in the trees of the two growing forms. In this study, the ecosystem biomass included the above- and below-ground tree components. The maximum biomass value was found in the above-ground of high forest form (252.77).

The evaluation of the carbon sequestration potential requires careful consideration of the amount of carbon in the tree tissues, which, in most studies, was considered as 50% of the weight of the tree biomass [13]. The present study showed that the carbon concentration is different in the tissues for the two growing forms. **Table– 1** shows Different average biomass and carbon stocks (t C /ha) of above-and below-ground in two growing forms.

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ISSN: 0976-3104

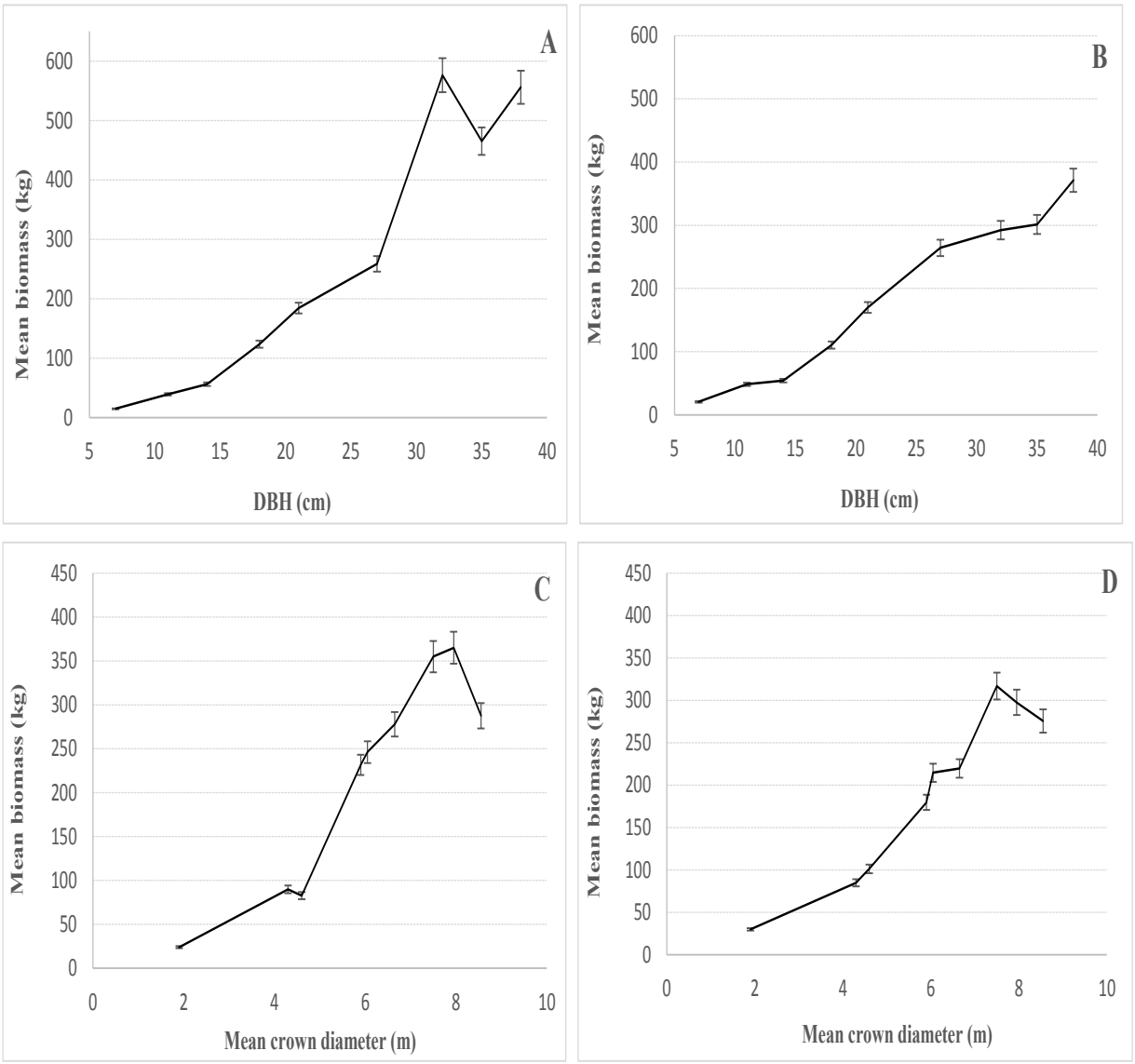

Fig: 3. Average biomass weight (kg) in trees of the two growing forms; High forest (A , B) and coppice (C , D) of above (A , C) and below-ground (B , D).

Table: 1. Different average biomass and carbon stocks (t C /ha) of above-and below-ground in two growing forms

Form growth	Component	N*hectar	Mean tree biomass (kg)	Biomass (T/ha)	Carbon storage (T/ha)
High forest	Above-ground	66.88	252.77	16.905	8.279
	below-ground		181.36	12.129	5.969
Coppice	Above ground	62.88	217.70	13.688	6.690
	below-ground		191.02	12.011	5.913
Sum		129.76		54.73±.987	26.85±.477

This study shows that, the carbon stock is higher in above-ground biomass with 14.969 t c/ha compared to below-ground biomass with 11.882 t c/ha.

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Southern Zagrosian forests

Figure– 4 shows the amount of the ecosystem trees per hectare from two growing forms of the Basht stands. Number of trees per hectare in high forest form which were 60.33 and 52.22 for coppice respectively.

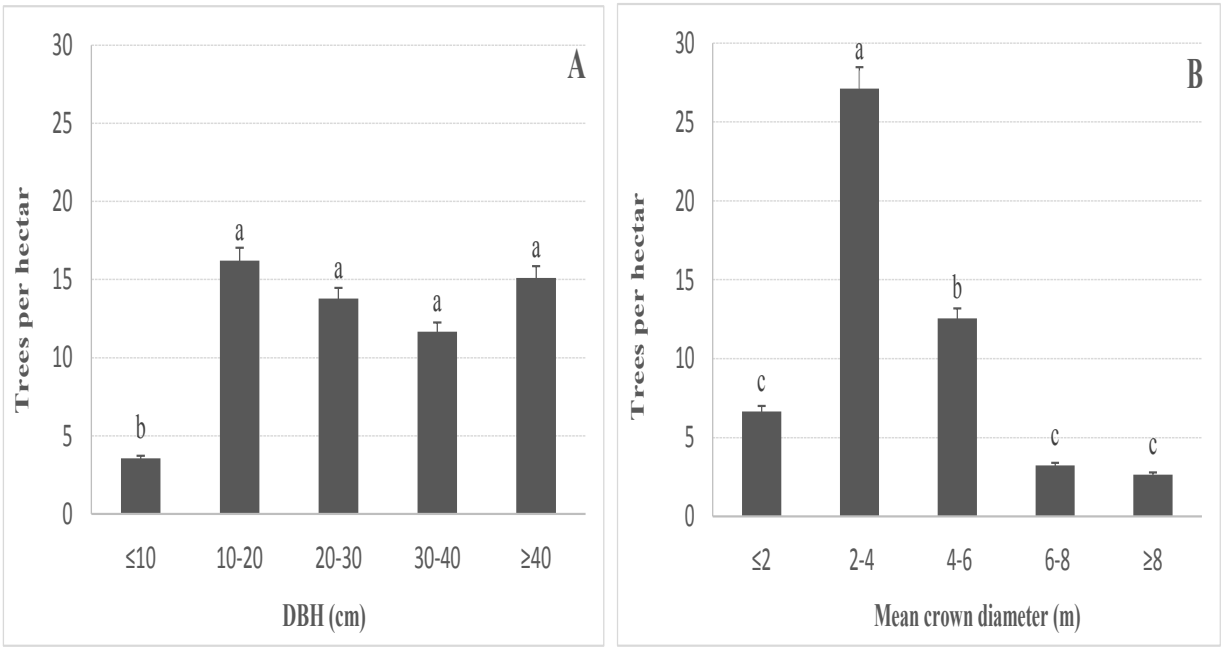

Fig: 4. The average number of trees per hectare in different diameter classes; high forest (A) and Coppice (B) trees

Figure–5 shows the amount of the ecosystem biomass in the trees of the two growing forms. In this study, the ecosystem biomass included the above- and below-ground tree components. The maximum biomass value was found in the above-ground of high forest form (227.76). The present study showed that the carbon concentration is different in the tissues for the two growing forms. **Table– 2** shows Different average biomass and carbon stocks (t C /ha) of above-and below-ground in two growing forms.

Table: 2. Different average biomass and carbon stocks (t C /ha) of above-and below-ground in two growing forms

Form growth	Component	N*hectar	Mean tree biomass (kg)	Biomass (T/ha)	Carbon storage (T/Ha)
High forest	Above ground	60.33	227.77	13.739	6.725
	below-ground		170.45	10.283	5.035
Coppice	Above ground	52.22	197.99	10.339	5.054
	below-ground		167.24	8.733	4.270
Sum		112.55		43.09±.457	21.08±.224

This study shows that, the carbon stock is higher in above-ground biomass with 11.76 t c/ha compared to below-ground biomass with 9.324 t c/ha.

In total, the average of carbon stock in Dehdez ecosystem located in central Zagrosian forest with 26.85 t c/ha is higher to Basht ecosystem located in south zagrosian forest with 21.08 t c/ha **[Table– 1 and 2]**.

ENERGY

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ISSN: 0976-3104

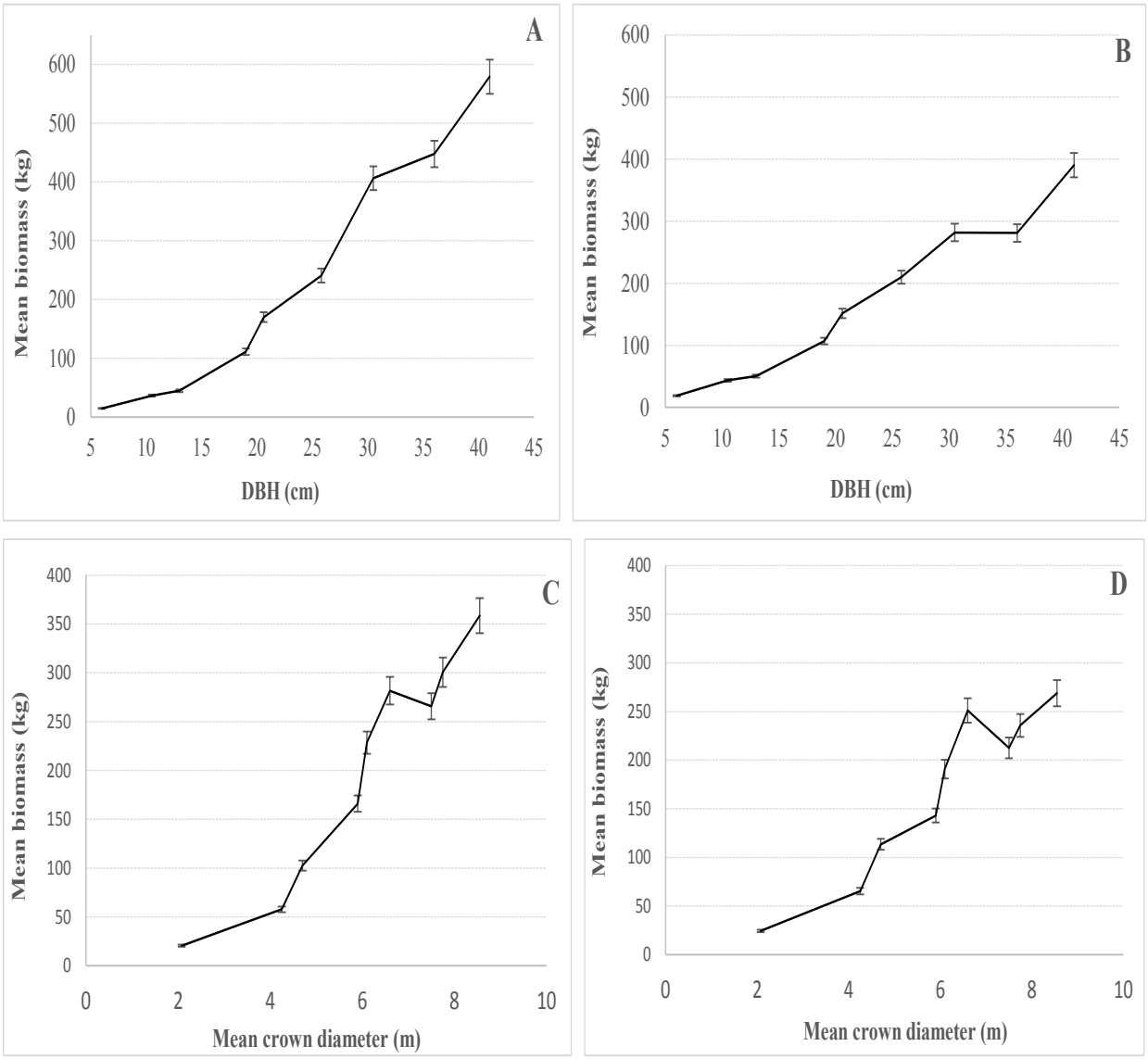

Fig: 3. Average biomass weight (kg) in trees of the two growing forms; High forest (A , B) and coppice (C , D) of above (A , C) and below-ground (B , D).

DISCUSSION

In the west of Iran in Zagrosian forests (with an area of 5 million hectares), oak manna trees (*Quercus brantii* var. *persica*) are the dominant species in 1000-2300 m above sea level. This forest has the most extensive habitat among oak species in Iran [14].

The Zagrosian forests have always been within easy reach of farmers, nomads, traders, and armies crossing the Zagros mountains on their way between Mesopotamia and central Persia. Archaeological evidence shows that these forests have been exploited economically for millennia. Human interference, in combination with climatic and other ecological factors (soils, topography), must therefore be considered as decisive for the distinctly different character of this forest type.

This study allowed us to estimate the carbon stock of above-ground biomass (AGB) and below-ground biomass (BGB) in central and south Zagrosian forests. The results of central Zagrosian forests shows that, total average

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biomass in two growing forms approximately 54.73 and 26.85 for carbon stocks, respectively. In the stand, the average biomass of high forest growing form 29.034 and 25.699 t/ha for coppice trees. And the average carbon stocks of high forest growing form 14.248 and 12.603 t c/ha for coppice trees. For southern Zagrosian forest, results showed that, total average biomass in two growing forms approximately 43.09 and 21.08 for carbon stocks, respectively. In the stand, the average biomass of high forest growing form 24.022 and 19.072 t/ha for coppice trees. And the average carbon stocks of high forest growing form 11.760 and 9.324 t c/ha for coppice trees.

There might be reason for the observed characteristics of the biomass ratios **[Figure– 2 and Figure– 4]**. First regarding to the stands characteristics **[Figure– 2 and Figure– 4]** the plantation sites differed from the diameter classes ecosystem. The Dehdez ecosystem had a higher variation of diameter classes compared to the Basht ecosystem. However, it was not possible to harvest all diameter classes.

As mentioned above, the difference is caused mainly by stand density, age and sometimes by different ecotypes or subspecies (including hybrids). The altitudinal range of Dehdez ecosystem is higher than Basht ecosystem. There might be reason for the observed of the biomass and carbon stocks ratios.

As a rule of the thumb, precipitation mainly occurs in winter and averages around 400-800 mm, so that approximately 70 % of it, falls in the second half of the year [15]. Maybe is another reason for the rise in this ratio the comparable studied sites, In the Dehdez ecosystem mean precipitation in higher than Basht ecosystem. Carbon concentrations differed with tree forms and tree components. Carbon content of tree componenets varied **[Table– 1 and Table– 2]**. The average carbon accumulation including all tree parts was higher in high-forest followed by coppice. The mean carbon concentration was found very close to the 50 percent value often used for estimation of carbon storage from dry biomass. Kraenzel et al [6] reported the range of 45.2 to 50.4 percent carbon in different tree components, which is tru in present study also [7].

ACKNOWLEDGEMENT

None.

CONFLICT OF INTEREST

There is no any form of conflict of interested.

FINANCIAL DISCLOSURE

No financial support was received for this work.

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ISSN: 0976-3104
REGULAR ISSUE
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ARTICLE OPEN ACCESS

RELIABILITY OF PAR AND IOTN INDEICES IN NORTH EAST INDIAN POPULATION: A PILOT STUDY

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ABSTRACT

Background: *rationale behind of this study was to evaluate the severity of malocclusion in north East Indian populations in relation to know what types of malocclusion and associated orthodontic treatment need.* ***Methods****: this study was carried out in north East Indian populations (the department of orthodontics, Mansarovar dental college kolar road Bhopal madhyapradesh state India). Study models were collected from department store, sum of 93 pre treated study models were collected. (Age, 16-24 years). The peer assessment rating (PAR) index was used to determine the severity of their malocclusions. To treatment need assessed by the dental health component (DHC) and the esthetic component (EC) of the index of orthodontic treatment need.* ***Results****: The mean PAR scores were 17, 29, 21, and 19 for Class I, Class II Division 1, Class II Division 2, and Class III, respectively. A statistical value concludes that the mean and median PAR scores of Class II Division 2 malocclusions were significantly higher than the other types of malocclusion (P .005).In comparison with PAR index value with IOTN index, it reports that the treatment need group is much greater than no treatment need.* ***Conclusions:*** *This study was concluded that the north East Indian population's posses Class II malocclusions to be more significant than other two class of malocclusion. Furthermore, PAR score seemed very high in class II division 2 malocclusion, as compare to class I and III.*

Received on: 24th -April-2016
Revised on: 18th -May-2016
Accepted on: 4th– June-2016
Published on: 14th– June-2016

KEY WORDS

malocclusion , index, PAR, IOTN, esthetic, component

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INTRODUCTION

PAR index can be used as best tool to diagnose orthodontic treatment outcome. Several investigators have been accepted, applied and suggested that the peer assessment rating (PAR) index is valid tool to assess the severity of malocclusion and its treatment outcome PAR index evaluate the practitioner's capability along with epidemiological survey. Hence this PAR index is used as tool in this study [1]. The utility of occlusal indexes is to scrutinize, research, decision making, and assessing orthodontic treatment need and outcome is well accepted worldwide. The peer assessment rating (PAR) index was to provide appropriate summary score for occlusal anomalies and to evaluate approximate deviation of a malocclusion from normal alignment and occlusion [2]. Scores of PAR index and orthodontic treatment need index were found significantly co-related. However with exception UK, US, score of PAR index, few recent studies evaluated that with cutoff score of 17 as optimal points, can be used for decision making of orthodontic treatment need [2-5]. Various types of orthodontic indexes have been projected to provide information on the prevalence of malocclusions and independently enumerate the severity of the various features of malocclusion. The index of orthodontic treatment need (IOTN) and PAR index [3]. ORTHODONTICS treatment need index composed of dental health component (DHC) and esthetic component (EC) [4]. Thus the scores of this index guide us to evaluate the occlusal trait and dental, esthetic health impairment. The recommended cutoff scores that establish treatment need are DHC grades 4-5 and EC grades 8-10,as the validity and reliability of PAR index is very high all the time [5-6]. Few current studies have been concluded that more that 63% samples were untreated, had a definite need of orthodontic treatment [7]. However due less knowledge of orthodontic treatment many of patients are unaware of esthetic relation with orthodontic treatment [6-8]. The important rationale behind of this study was to evaluate the severity of malocclusion in Bhopal population in relation to know what types of malocclusion and associated orthodontic treatment need. With the help of PAR and treatment need index.

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ISSN: 0976-3104

MATERIAL AND METHODS

The sample for this study was carried out in north East Indian populations. Study models were collected from department store, sum of (n=93, age 16-14) pre treated study models were collected. Before collecting study cast thorough case history was taken in to consideration.

Inclusive criteria were no history of orthodontic treatment, serial extractions, and craniofacial anomalies. Type of malocclusion was defined according to the British Standard Institute Incisor Classification.

Study model analysis were done by trained post-graduate students of the department and based on score obtained severity of malocclusion was evaluated using PAR and IOTN index , by single examiner guide by me , calibrated for both.

Sample were divided into two groups and analysis were done, to avoid error two week later model analysis were repeated and mean value was taken. Based on value obtained treatment need grouped in to two group

1. No treatment need (DHC,1-3;EC1-7)
2. Treatment need (DHC, 4-5; EC, 8-10)

Statistical analysis

Intraexaminer scores were assessed for the PAR, ANOVA statistical analysis was used, and the kappa statistic was used to evaluate intraexaminer scores for DHC and EC assessment. Appropriate statistical analysis was used to evaluate the PAR scores to differentiate the types and severity of malocclusion.

T test was used to evaluate the accuracy in PAR score, to differentiate between the no-treatment-need and treatment-need groups for dental health or esthetic impairment were assessed. Note that the statistical was set ($P<0.05$) and possible statistical analysis were performed with help of SPSS software also used.

RESULTS

Inspection of the intra-examiner agreement of two post graduates resulted in the exclusion of two. The inter-examiner agreement (ICC) was 0.90 and the ICC for the intra -examiner-agreement ranged from 0.60 to 0.86. For each case the mean clinical sense determined by two inters and intra examiners were compared with their mean indicated treatment point, which were 4.43. When this value was more than or equal to 4.43, the case was labelled as 'Treatment need'. The others were labelled as 'no treatment need' **[Supplementary Table-1, Supplementary Figure-1]**.

The examiner agreement (PAR) score ranged for the intra-examiner agreement from 0.33 ($P > 0.05$) to 0.58 these score indicates acceptable with assessment of student T test, table number 1. Clarify the detail score of PAR and for class I, II divsion1, division 2, and III malocclusion.

The inter-examiner agreement (IONT) score ranged for intra-examiner from 0.02 ($P > 0.05$) to 0.49. These results are low due to the high prevalence of scores above 4.43. From obtained values mean and median PAR scores of Class II Division 2 malocclusions were significantly higher than the other types of malocclusion (P .005). In comparison with PAR index value with IOTN index, it reports that the treatment need group is much greater than no treatment need **[Supplementary Table-2, Supplementary Figure-2]**.

DISCUSSION

Scores of PAR index reveals that the most of north East Indian populations can be categorized under treatment need section [7]. Furthermore, class II division 2 clears that PAR score highest among the three classes of malocclusion [8]. These results suggest that Class II malocclusions in north East Indian populations have more occlusal-traits and treatment need than Class I or Class III malocclusions [9]. With reference table II, clears that the treatment need group can be categorized with higher score than treatment not needed. This becomes significantly clear when we compare **Supplementary Table-2, Supplementary Figure-2** [10]. Significant relationship between malocclusion severity and level of treatment need was found ($P <.001$).

The existence of low PAR score in treatment need group still suggestive of potential dental-health impairment [11]. Second important factor can be seen in study models which delaying the patient to treatment alough they were in treatment need group was presence of deciduous teeth which they were maintaining the Overjet, occlusal traits [9-11].

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ISSN: 0976-3104

Treatment need index divide in to dental health and esthetic component, but A patient with a mild Class I malocclusion with unilateral posterior crossbite of at least 1 tooth with functional shift might have acceptable esthetics despite the potential for compromised dental health [11]. This could the rationale behind that most of the Bhopal populations under the group of treatment need, but still most of them were not perusing treatment. However, their apical radiographs reveal that they in high PAR score index [7-12]. Most of the previous studies have used PAR score as key factor in decision making with cutoff values of 17 score, and 21 PAR for esthetic impairments. Furthermore, those studies have agreed and accepted the PAR and IOTN scores [9-11].

The study carried out by me in department, could be directly compared with the PAR; still we have achieved the similar results. We found that PAR 17 was the optimum cutoff for presumed compromised dental health, and PAR 21.for esthetic impairment [7-11]. However, considering the optimum cutoff PAR values need not be always similar to decided treatment needed, because it might not be necessarily identical with dental health and dental esthetic [5-12]. Most of the recent studies were using index of complexity, key values for treatment out come and esthetic evaluation. Thus it's always advice and suggestive of replacement of PAR and IOTN indices for current status and results of Bhopal population.

CONCLUSION

This study was concluded that north East Indian populations' posses Class II malocclusions to be more significant than other two class of malocclusion. Furthermore, PAR score seemed very high in class II division 2 malocclusion, as compare to class I and III. In treatment need group PAR score were significantly higher than those with borderline or no treatment need cadre. PAR index hold best for esthetic component then dental health need.

CONFLICT OF INTEREST

The author declares having no competing interests.

ACKNOWLEDGEMENT

None.

FINANCIAL DISCLOSURE

Institutional Support was received.

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ISSN: 0976-3104

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SUPPLEMENTARY INFORMATION (As supplied by authors)

Supplementary Table-1

Type of Malocclusion	Severity of malocclusions by PAR scores Total sample n 93			
	Number of cases	%	Mean score SD	Median score
Class I	44	47.8	17	16
classII div 1	25	24.5	21	19
ClassII div 2	03	3.2	29	31
Class III	21	22.5	19	15

Supplementary Table-2

Type of malocclusion		Treatment need N=93					
		%			%		
		DHC 1-3	DHC 4-5	P value	EC 1-7	EC 8-10	P value
Class I	44	55	41		73	21	
ClassII-1	25	41	55		65	29	
ClassII-2	03	34	62	0.081	42	52	0.080
ClassIII	21	41	55		62	30	

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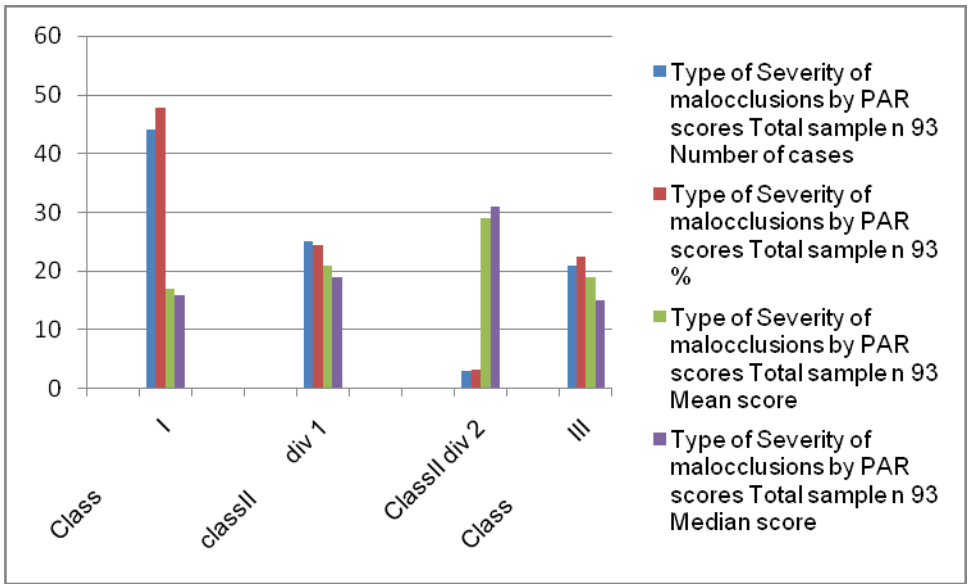
ISSN: 0976-3104

Supplementary Figure-1



Supplementary Figure-2