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ELEMENTAL ANALYSIS AND PROTEIN QUANTIFICATION OF RAW NATURAL RUBBER OF IAC SERIES 400 CLONES

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Protein, nitrogen and sulfur contents were investigated for natural rubber from commercial *Hevea*, synthetic polyisoprene, and new IAC clones from Mococa city (IAC 405, 406, 410, 413, and 420), Jaú city (IAC 400, 401, 402, and 417), and from RRIM 600 clone (used as a control in both cases). IAC 405 and RRIM 600 clones showed, respectively, the highest nitrogen and protein contents among the clones from Mococa, and similar sulfur results. A different trend was observed for Jáu, where RRIM 600 and IAC 400 clones showed the highest nitrogen and sulfur contents, respectively, showing that not only the clone type but also the region of plantation plays an important role on determining the rubber composition.

Introduction

Natural rubber (NR) is a polymer composed of 320 to 35,000 isoprene molecules. Among the natural rubber producing plant species, the Brazilian rubber tree (*Hevea brasiliensis*) is the only commercial source at present, due to its high rubber content and quality [1].

Natural rubber from *Hevea brasiliensis* is mainly composed of rubber hydrocarbon (about 94%) and small amounts of non-rubber components, such as proteins, lipids, sugar, ash, etc. The non-rubber components amounting to about 6% of solid NR are believed to produce outstanding properties of NR, especially for cured rubber properties. In these non-rubber components, proteins and lipids are found to have an important role [2].

Embrapa Agricultural Instrumentation (Embrapa/CNPDIA) and Agronomic Institute (IAC) have been conducting a Brazilian *Hevea* breeding with emphasis on the development of new clones more appropriated to the soil and climate of São Paulo state and on the evaluation of the properties of the latex and rubber from these new clones.

The aim of this work is to study the nitrogen, sulfur, and protein contents of the natural rubber of the new Brazilian clones from IAC series in comparison with a synthetic polyisoprene and a commercial *Hevea* rubber.

Experimental

Natural rubber from different IAC clones from Mococa city (IAC 405, 406, 410, 413, and 420), from Jaú city (IAC 400, 401, 402, and 417), and from RRIM 600 clone, used as a control, was collected from IAC experimental plantations. The samples were naturally coagulated in the field. The Brazilian clones were compared with synthetic polyisoprene latex supplied by Kraton Polymers and a commercial sample of ammoniated *Hevea* latex supplied by Guthrie Latex, Inc.

Nitrogen and sulfur contents of rubber samples were evaluated through high temperature catalytic tube combustion using an elemental Vario MACRO CNS analyzer with thermal conductivity detection.

Protein content was determined according to the Lowry procedure based on ASTM D5712 [3] and ASTM D 1076 [4].

Results and Discussion

Nitrogen content represents the nitrogenous compounds attached to rubber particles and/or rubber molecules [5]. The nitrogen content of dry rubber indicates the quantity of proteins present. It has been shown that these proteinacous materials can exert various effects on the technological properties of rubber [6]. The ABNT (Brazilian Association of technical Norms) and SMR ((Standard Malaysian Rubber) specification of maximum limits is 0.6% for nitrogen content.

Results of nitrogen and sulfur contents for different clones of IAC series from Mococa and Jaú are shown in Figures 1 and 2, respectively. The average values of nitrogen content, for all samples from both, Mococa and Jaú cities, are within the standards recommended by the ABNT and the SMR for a good rubber quality.

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For clones from Mococa, IAC 405 shows the highest, and IAC 410 the smallest nitrogen contents. The results of nitrogen and sulfur of the new clones are similar to those of the control, RRIM 600 clone, and they are comparable to those of commercial *Hevea* and synthetic polyisoprene, Figure 1. As expected, the nitrogen content of natural rubber from IAC clones and from commercial *hevea* is higher than that of the synthetic polyisoprene.

The IAC clones from Jaú showed nitrogen contents lower those that of the control RRIM 600 clone and than those of the clones from Mococa. RRIM 600 clone and IAC 417 clone showed the highest and lowest nitrogen content, respectively, Figure 2. Differently from what was observed for the sulfur content of the clones from Mococa, the sulfur content varies among the clones from Jaú.

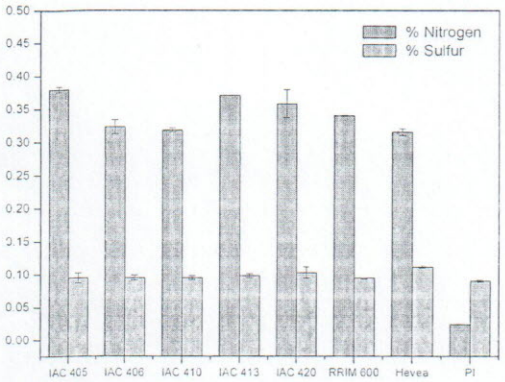

Figure 1 – Nitrogen and sulfur percentages of IAC clones from Mococa city.

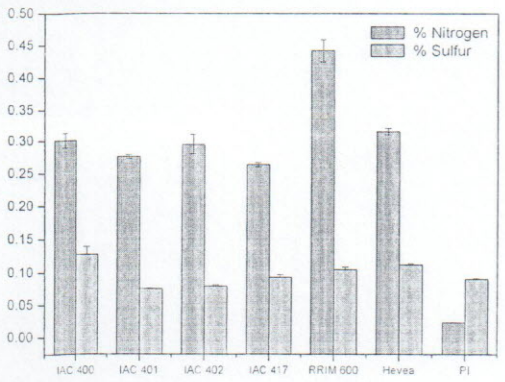

Figure 2 – Nitrogen and sulfur percentages of IAC clones from Jaú city.

According to Yip [6] the nitrogen content of NR is largely associated with proteinaceous materials present, and it is widely used as an index of the protein content of NR [7]. Figure 3 shows the total protein, expressed as micrograms protein per gram of dry weight rubber, for the clones from Mococa. It can be observed that IAC 405, the clone that showed the highest nitrogen content, did not present the highest protein content. It can also be observed that IAC 406 clone, which has one of the smallest nitrogen, showed the highest protein content. These results indicate that for the IAC clones, the correlation between nitrogen and protein contents is not linear.

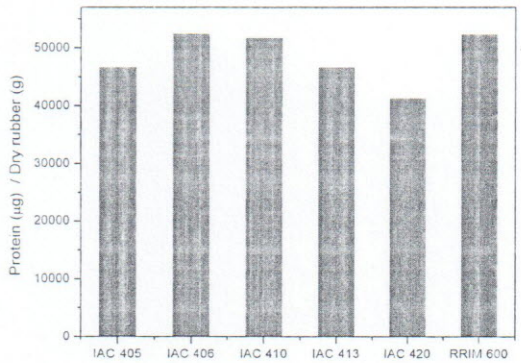

Figure 3 – Protein quantification of IAC clones from Mococa city.

Conclusions

IAC 405 and RRIM 600 clones showed, respectively, the highest nitrogen and protein contents among the clones from Mococa city, and similar sulfur results. A different trend was observed for Jáu city, where RRIM 600 and IAC 400 clones showed the highest nitrogen and sulfur contents, respectively, showing that not only the clone type but also the region of plantation plays an important role on determining the rubber composition.

Acknowledgements

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