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EUPHORBIA TIRUCALLI, ACUPUNCTURE AND BIOTECHNOLOGICAL POTENTIAL OF LATEX: PRELIMINARY QUALITATIVE EVALUATION AND PERSPECTIVES

EUPHORBIA TIRUCALLI, ACUPUNTURA E POTENCIAL BIOTECNOLÓGICO DO LÁTEX: AVALIAÇÃO QUALITATIVA PRELIMINAR E PERSPECTIVAS

EUPHORBIA TIRUCALLI, ACUPUNTURA Y POTENCIAL BIOTECNOLÓGICO DEL LÁTEX: EVALUACIÓN CUALITATIVA PRELIMINAR Y PERSPECTIVAS

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ABSTRACT

Euphorbia tirucalli is a plant species used for millennia in traditional medicine around the world, especially in Africa and Asia. It has a complex chemical composition, containing modified latex in its stem for defense and intelligent adaptation to inclement weather, which also allows economic use by indigenous peoples and traditional communities. It is a species widely used and researched by China and Japan, countries that maintain their traditional medicines, even influencing national and international markets. This chapter aims to present qualitative and preliminary observations of an innovative methodology using the insertion of an acupuncture needle into the nodal region of the plant specimen's stem for 24 consecutive hours, with subsequent qualitative tests on the digestive activity of this latex, aimed at local environmental problems, such as paper reuse, shrinkage of propylene plastic (IPP-5) for a circular economy, and action against ectoparasites. The chemical analysis of the chemical production of this latex under acupuncture intervention could not be performed because this observation was conducted during the pandemic period of social isolation. Preliminary results presented as qualitative observations revealed an increase in resinous activity, similar to gum, transforming white paper into the appearance and consistency of papyrus. Contrary to previously reported results, no digestion of the IPP-5 plastic occurred. The ectoparasites became inert within eight hours, possibly due to the mechanical effect of this thicker latex. It is noteworthy that the main nodal segment of this specimen developed extensive lignification

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(never before observed) over six months, recovering its apical activity and with new lateral buds. The chemical production of lignin is of interest, including pharmacological ones. Based on these preliminary observations, a methodological protocol for acupuncture in succulents is being outlined, as the characteristics of this botanical genus will allow for rational investigation of interventions in plant development, chemical production, and biological activities of local environmental action, which may result in financial autonomy for members of indigenous peoples and traditional Eastern communities residing in Brazil in the face of climate-socioenvironmental uncertainties. Furthermore, the possibility of expanding the eco-perception of our undergraduate and graduate students regarding the health-environment relationship and environmental bioethics.

Keywords: *Euphorbia tirucalli*. Acupuncture. Biophysics. Electrochemistry. Resinous Bioproduct. Potential Plant Bioprocess.

RESUMO

Euphorbia tirucalli é uma espécie vegetal de uso milenar em medicina tradicional ao redor do planeta, especialmente nos continentes africano e asiático. Porta composição química complexa, contendo em seu caule modificado látex para sua defesa e adaptação inteligente frente às intempéries, que também permite o emprego econômico de povos originários e comunidades tradicionais. É espécie muito usada e investigada pela China e Japão, países que mantêm suas medicinas tradicionais, inclusive influenciando os mercados nacionais e internacionais. O presente capítulo visa apresentar observações qualitativas e preliminares de metodologia inovadora utilizando-se a inserção de agulha de acupuntura em região nodal de caule do espécimen vegetal por 24 horas seguidas, com posteriores testes qualitativos quanto à atividade digestora deste látex, voltada para problemas ambientais locais, tais como reuso de papel, retração de plástico propileno (IPP-5) visando economia circular bem como ação contra ectoparasita. A análise química da produção química deste látex sob intervenção da Acupuntura não pôde ser realizada pois esta observação foi realizada durante o período pandêmico de isolamento social. Como resultados preliminares apresentados como observações qualitativas, houve o incremento da ação resinosa similar ao efeito de goma, transformando papel branco no aspecto e na consistência de um papiro; ao contrário de resultados prévios já comunicados, não ocorreu digestão do plástico IPP-5. Os ectoparasitas tornaram-se inertes em oito horas, possivelmente pelo efeito mecânico deste látex mais espesso. Digno de nota, o segmento nodal principal deste espécimen ao longo de 6 meses desenvolveu extensa lignificação (nunca antes observada), recuperando sua atividade apical e com novos brotamentos laterais. A produção química de lignina é de interesse, inclusive farmacológico também. Em função destas observações preliminares, protocolo metodológico para Acupuntura em suculentas vem sendo delineado, pois a característica deste gênero botânico permitirá a investigação racional da intervenção no desenvolvimento vegetal, na sua produção química, e em atividades biológicas de ação ambiental local, que poderão resultar em autonomia financeira para membros de povos originários e de comunidades tradicionais orientais que residem no Brasil frente à incertezas climáticassócioambientais. Outrossim, a possibilidade de ampliação da ecopercepção de nossos estudantes de graduação e de pós-graduação quanto a relação saúde-ambiente e bioética ambiental.

Palavras-chave: *Euphorbia tirucalli*. Acupuntura. Biofísica. Eletroquímica. Bioproduto Resinoso. Bioprocesso Potencial em Plantas.

RESUMEN
Euphorbia tirucalli es una especie vegetal utilizada durante milenios en la medicina tradicional mundial, especialmente en África y Asia. Presenta una composición química compleja, con látex modificado en su tallo para la defensa y la adaptación inteligente a las inclemencias del tiempo, lo que también permite su uso económico por parte de pueblos indígenas y comunidades tradicionales. Es una especie ampliamente utilizada e investigada por China y Japón, países que mantienen sus medicinas tradicionales, influyendo incluso en los mercados nacionales e internacionales. Este capítulo tiene como objetivo presentar observaciones cualitativas y preliminares de una metodología innovadora que utiliza la inserción de una aguja de acupuntura en la región nodal del tallo de la planta durante 24 horas consecutivas, con posteriores pruebas cualitativas sobre la actividad digestiva de este látex, orientada a problemas ambientales locales, como la reutilización del papel, la contracción del plástico de propileno (IPP-5) para una economía circular y la acción contra los ectoparásitos. El análisis químico de la producción química de este látex bajo intervención de acupuntura no se pudo realizar porque esta observación se realizó durante el período de aislamiento social por la pandemia. Los resultados preliminares, presentados como observaciones cualitativas, revelaron un aumento de la actividad resinosa, similar a la de la goma, que transformó el papel blanco en la apariencia y consistencia del papiro. Contrariamente a resultados previamente reportados, no se produjo digestión del plástico IPP-5. Los ectoparásitos se volvieron inertes en ocho horas, posiblemente debido al efecto mecánico de este látex más espeso. Cabe destacar que el segmento nodal principal de este espécimen desarrolló una lignificación extensa (nunca antes observada) durante seis meses, recuperando su actividad apical y con nuevas yemas laterales. La producción química de lignina es de interés, incluyendo la farmacológica. Con base en estas observaciones preliminares, se está delineando un protocolo metodológico para la acupuntura en suculentas, ya que las características de este género botánico permitirán la investigación racional de intervenciones en el desarrollo vegetal, la producción química y las actividades biológicas de la acción ambiental local, lo que podría resultar en autonomía financiera para los miembros de pueblos indígenas y comunidades tradicionales orientales residentes en Brasil ante las incertidumbres climáticas y socioambientales. Además, la posibilidad de ampliar la ecopercepción de nuestros estudiantes de pregrado y posgrado respecto de la relación salud-ambiente y la bioética ambiental.

Palabras clave: *Euphorbia tirucalli*. Acupuntura. Biofísica. Electroquímica. Bioproducto Resinoso. Posible Bioproceso en Plantas.

1 INTRODUCTION

Euphorbia tirucalli is a species of African origin, described as having originated in the Pangea era, and has been used for millennia in ethnomedicine and traditional oriental medicine (Wasim, 2019), as shown in Table 1.

Table 1

Use of E. tirucalli in ethnomedicines, traditional medicines and popular uses

***Euphorbia tirucalli*Country or Locality**	**Traditional use**	**Precautions/Mechanism**	**Used part**	**Bibliographic Reference**
Brazil	Relief of pain crisis in a reactional outbreak of Tuberculoid Leprosy, Pemphigus foliaceus (wildfire)	Not reported	Latex in water	NEIVA, L. (1968)
Mauritius Andes	Laxative. Respiratory complaints; Antivenereal.	Not reported	Decoction of roots and shoots	DARUTY, 1886; GURIB-FAKIM, 1990 apud GURIB-FAKIM and GUEHO, 1996
Peruvian Amazon (Skeleton, rooster's foot, navidenha/birth-bearing plant)	Asthma, abscesses, cancer, colic, neuralgia, earaches, toothaches, stomachaches, rheumatism, severe pain.	Not reported	Direct latex	Medicinal plants from the Botanical Garden Institute of Traditional Medicine, 1999;
Equatorial Africa	Hedge, insecticide, fish poison	Interruption in the mitochondrial respiratory chain	Whole plant and latex	FURSTENBERGER and HECKER, 1986
Equatorial Africa	Emetic in the treatment of snake bites	Not reported	Roots in water	FURSTENBERGER and HECKER, 1986
India, Indonesia and Brazil	Warts; Onychomycosis	Not reported. Topic.	Direct latex	JURBERG et al, 1985

Brazil	Anti-syphilitic	Not reported	Latex in water	JURBERG et al, 1985
India and Malaysia	Anti-Cancer	Not reported	Latex in water or alcohol	KINGHORN, 1979; FURSTENBERGER & HECKER, 1986).
Indigenous people of Brazil and native people of Africa	Rheumatism, asthma. Colic, neuralgia, and gastric pain	Not reported	Several parts	MALIK et al, 1989; MALIK & KHAN,1990

Source: *Adapted from Naema Wasim (2019).*

In African ethnomedicine (a secret whose medical transmission is via "mouth-to-ear"), it is considered a hot plant (to evoke sthenic reactions in asthenic organisms).

Below, Table 2 shows the evidence obtained in ethnopharmacological trials:

Table 2

Prospecting of the biological activities of the main species of the genus Euphorbia, by countries in the African and Asian continents whose Traditional Medicine is influential in the market

***E. tirucalli*Origin**	**Biological Activity**	**Part Used**	**Type of Study**	**Bibliographic References**
India	Oxytoxic property	Raw latex	Ethnographic Report	SAHA, SAVINI and CASINATHAN 1961, apud JURBERG et al, 1985
Africa	Anti-leukemic	Raw latex	*In vitro* study	EVANS and SOPER, 1978
India and Malaysia	Antineoplastic	Raw latex	Ethnographic Report *In vitro* study	KINGHORN, 1979
India	Molluscicide (B. glabrata); Fish toxicity (Lebistes reticulatus) Similar to Copper	Raw latex	*In vivo* study	VASSILIADES, 1984
Tropical Africa *Croton tiglium*, E. lathyris	Activate latent EBV by 8:14 translocation activation of the c-myc oncogene	Raw latex	*In vitro* study	ITO, 1985 apud BOSCH, 1993

Kenya and Tanzania; Uganda and Malawi;	Cofactor in Malaria and Endemic Burkitt's Lymphoma: Inhaled, ingested and/or absorbed through the skin?	Raw latex	Ethnographic Report	MIZUNO et al, 1986; BOSCH et al, 1993 and 2004
Malaysia and Africa	Antineoplastic	Raw latex	*In vitro* study	FURSTENBERGER and HECKER, 1986
Africa	EBV-specific cellular immunity and malaria; EBV-transformed B lymphocytes resistant to cytotoxic killer T cells	Raw latex	*In vitro* study	IMAI et al, 1994
India and China	Antivirals	Teas and fresh raw latex	Ethnographic Report	APPENDINO; SZALLASI, 1997
Middle East	Antibacterial, prostaglandin E2 (PGE2) inhibitory, antitumor activity, including against multidrug-resistant (MDR) tumors	Macrocyclic diterpenoids of Euphorbia species	*In vitro* study	ABDELGALEIL et al, 2001; HOHMANN et al, 2002
Japan	Reduction of the cytopathic effect of HIV-1 on MT-4 cells	Synthetic phorbol derivatives	*In vitro* study	EL-MEKKAWY et al, 2002.
Japan	Antiviral activity	North American, European, Arabic, Chinese and Japanese raw latex	*In vitro* study	AKIHISA et al, 2002

Japan	Antioxidant and immunomodulatory activity	Raw latex of Japanese origin *E. tirucalli*, as for other species of this genus	*In vitro* study	LIN et al, 2002.
India	Pesticide	Raw latex	*In vitro* study	DAMODARAN, 2002.
China	Reversibility of PKC binding and translocation by increasing phorbol hydrophilicity	Synthetic latex	*In vitro* study	WADA et al, 2002.
India and China	Asthma	Stem with latex	*In vivo study*	LAI et al., 2004.
African Continent	Immunosuppressive activity via inhibition of phagocytosis, decreased CD4+ T lymphocyte count in peripheral blood, and neutrophil count in pleural exudate.	Ethyl acetate extract of *E. royleana*	*In vitro* study	BANI et al, 2005
African Continent	Diarrheal diseases, asthma, cancer, parasites, leprosy, scorpion stings and syphilis	Teas and fresh latex	Ethnographic Report	ELUJOBA et al., 2006
African Continent	Bactericide; Molluscicide	Raw latex	*In vitro* study	BANI et al, 2006
African Continent	Myelomodulatory activity in rat ascitic tumor	Stem	*In vivo* study	BANI et al, 2006

African and Asian continents	Antimicrobial activity	Extracts from the latex of Euphorbia species	*In vitro* study	SUDHAKAR et al., 2006; BARLA et al., 2007; KAMBA; HASSAN, 2010
India	Antivirals	Stem teas and fresh latex	Ethnographic Report	GUPTA et al., 2007
India and China	Asthma	All parties	Ethnographic Report	SHLAMOVITZ et al., 2009
African Continent	Various diseases	All parties	Ethnographic Report	MWYNE; VAN DAMME, 2011
Middle East	Antimicrobial activity against: Klebsiella pneumoniae, Shigella dysenteriae, Proteus mirabilis, Pseudomonas aeruginosa, Bacillus subtilis, Micrococcus sp., Staphylococcus aureus and Candida albicans.	Total extract	*In vitro* study	KIRBAG et al., 2013
Middle East	Antibacterial and antifungal activities	Ethanolic extract of latex	*In vitro* study	IBRAHIM et al., 2019

Source: *Adapted from Naema Wasim (2019).*

The species' historical and geographic distribution is cosmopolitan. In highly saline soils, such as Madagascar, this succulent produces diterpene esters whose esterified and even aromatic chains induce oxidative stress. However, plant chemical labeling by HPLC/UV has also detected conditions where it is more active on the membrane and cell wall due to the presence of polyhydroxylated, hydrophilic, cytotoxic, and erosive diterpenes at the local level (Varricchio, 2005).

Natural products that cause local and physiological oxidative stress are of interest as potential degradation products of persistent materials in nature. Varricchio et al. (2006) investigated the effect of different soil nitrogen concentrations on the cultivation of *E. tirucalli*, resulting in changes in the thickness and chromatographic analysis of the latex from garden and from cultives (Gaspar et al., 2025).

Widely used and investigated by the Chinese and Japanese because it is considered a plant species rich in Chi. As additional information, it can be said that for both peoples, Chi can be defined as life force, vitality, or simply energy that flows between Yin and Yang. In Traditional Chinese and Japanese Medicine, therefore, it is considered a Chi-rich, sthenic plant, still used in conjunction with acupuncture (Chia and Li, 1996 apud Colares and Mejia, 2010).

In addition to the Far Eastern notion of the eternal transformation of energy that flows through the Tao's Yin and Yang ("condenses-liquefies"), there is also the Zhuangzig concept (Figure 1), or, in other words, the Chinese Theory of Energy Transformation in this path through the five elements (earth, wood, fire, water, metal), thus also constituting the material elements.

Figure 1

Zhuangzig – The Chinese Theory about Cicle of Transformation on the path through the Five Elements (Wu Xing)

Source: Free image from Internet.

During the period of social isolation, in addition to the use of herbaceous plants for cooking and teas, or other species for herbal medicine, due to the health restrictions related to travel, there was an increase in the popular economic use of useful plants and ornamental plants, among them *Euphorbia tirucalli*, whose latex is widely used as glue for repairing objects, which exposes it to the risk of toxicity upon contact.

Based on this Eastern principle of eternal movement—sometimes liquefying until it becomes aerial, sometimes condensing until it hardens—a question was posed: Could stimulation with an acupuncture needle phenotypically influence the plant chemical production of *E. tirucalli*?

The objective of this chapter is to qualitatively evaluate the physical action of acupuncture on the latex of *E. tirucalli* grown in a pot and its potential action of interest.

2 METHODOLOGY

-Intervention on the Plant Specimen

By inserting an acupuncture needle into the main nodal segment of E. tirucalli for 24 hours (Figure 2).

Figure 2

Insertion of a single Acupuncture needle into the main nodal segment of the modified stem of Euphorbia tirucalli for 24 hours

Source: *The Authors.*

- Erosion and Digestion of Materials:

White paper and egg white film dried at room temperature (egg albumin) cut into similar sizes. Six parts of each material were placed on an aluminum surface. Next, 0.1 mL of latex collected from E. tirucalli treated under acupuncture needle stimulation and diluted in water was applied to the center of these materials in the order (left to right): control and test. An observation curve of the corrosive action and shrinkage versus time was established.

- Erosion and Digestion of Propylene Plastic (IPP-5):

Polypropylene (PP - 5) was cut into 1.5 x 1.5 cm segments organized into groups of 3, arranged in quadruplicates (N = 12) per solution, totaling 120 segments arranged in three aluminum trays. Then, 0.2 mL of control solution (no. 1) and test

solutions (2 to 10) was applied to each cut PP surface. Next, a time and activity curve was established (Freire Souza Silva et al., 2023).

Acqueous extract of latex from *Euphorbia tirucalli* collected at 9:00 a.m. from Petropolis, Rio de Janeiro (1:10). So, 0.1 mL of this solution was applied to a PP surface (30 units with three repetitions), and time to retractile activity and to erosion curves were established.

For the qualitative evaluation of the physicochemical effect of the test solution on PP, scales adjusted for this material were adopted, in accordance with the literature: Regarding speed: immediate, in addition to mediate term: short (< 2 hours), medium (2 to 3 hours) and long term (> 3 hours). Regarding the contraction intensity: Low (< 2.5%), Medium (2.5%), High (> 3.0%)(Freire Souza Silva et al., 2023).

- Environmental Effect on Star Ticks:

Star ticks (*Amblyomma cajennense*) are important vectors of Rocky Mountain spotted fever. They can be found on various animals, including horses, dogs, and capybaras. Five star ticks were found on a riverbank.

They were collected in commercial glass jars. One tick was placed in each jar, followed by 0.1 mL of this aqueous latex extract. Signs of acute toxicity were observed over 12 hours.

3 RESULTS

Although the chemical variation of plant production under this needle insertion process has not yet been analyzed, since there was no laboratory operating during the period of social isolation, it can be said qualitatively that there were preliminary biological results, presented below.

- Acupuncture Intervention as a Bioprocess:

Aqueous extracts of *E. tirucalli* latex grown in a pot with an acupuncture needle inserted into its main nodal segment were able to increase latex thickening and resin production in a single application (0.2 mL) in hen's egg albumin.

Noteworthy was the prolonged effect observed over six months, as lignification of the stem occurred only in its main segment (see Figure 2), before never affected by this condition. After this period, as if the physical-chemical stimulus had ceased, it reemerged, with green shoots observed in the main nodal segment, shown in Figure 3:

Figure 3

Lignification of the stem of the specimen that received the needle insertion

Source: *The Authors.*

Both the insertion and manipulation of the acupuncture needle cause cellular damage that locally triggers the production of biochemicals, some of which are defense-related, as lignines. After acupuncture, the stimulus can be directed depending on the method of stimulation, the depth and angle of insertion of the needle, and the direction of its tip (Wendling da Silva et al., 2019).

- Erosion and Digestion of Persistent Inorganic and Organic Materials:

The solution was applied to albumin film and paper, making it thick, dry, and resistant, like papyrus, making it difficult for sticky materials to adhere (Figure 4). This result was similar to that previously observed by our group. It suggested the occurrence of natural polymerization, as with cellulose (Pinto, 2019; Machado/Duigó-TUKANO et al., 2019).

Figure 4

Best photo of the material tested – albumin film and paper – glued to the tray and twisted

Source: The Authors.

- Environmental Effect on Polypropylene Plastic (IPP-5):

No corrosive action of latex on plastic materials was observed in the short, medium, or long term (120 days), a result different from that observed by Freire Souza Silva et al. (2019). Qualitatively, upon collection, a thicker latex was observed. Within 24 hours, the raw latex of *E. tirucalli* began to adhere to the surface of the water-containing control, as well as to the egg white film (albumin). The albumin film, under the influence of *E. tirucalli*, became a type of powerful glue adhered to the tray.

However, on the paper, it suggested a papyrus effect, thickening and hardening it as a result of this thicker latex, possibly due to the effect of acupuncture. This observation is similar to that of Pinto (2019), who observed a similar effect of a 30% hydroalcoholic extract of *E. tirucalli*.

- Environmental Effect on Star Ticks:

The star ticks remained alive and active for the first six hours, attempting to climb the vials. Initially, they maintained mobility, but they progressively lost mobility until all five individuals became inert around eight hours later. Therefore, acute toxicity was observed. However, due to social isolation during the COVID-19 pandemic, there was no chemical labeling of the latex, nor were any tests conducted to investigate the mechanism of this toxicity through oxidative stress via the oxygen or nitrogen pathways.

It is worth noting that for this preliminary observation, where the control represents ticks that were not exposed to the test solution, there is a high probability that a mechanical effect of this extract occurred through its resinous action, which, acting as a gum that stuck together upon drying, prevented their movement. Based on this preliminary qualitative observation, methodological alignment is recommended for adequate investigation due to the potentially promising action in addressing a serious environmental problem such as the need to eliminate Rocky Mountain Spotted Fever vectors.

4 DISCUSSION

In general, no corrosive action of latex on plastic materials was observed in the short, medium, or long term (120 days), a result different from that observed by Freire Souza Silva and colleagues (2019). Qualitatively, upon collection, a thicker latex was observed. Within 24 hours, the raw latex of *E. tirucalli* began to adhere to the egg white

film (albumin). The albumin film, under the influence of *E. tirucalli*, became a type of powerful glue, remaining adhered to the tray. This distinct action suggested a papyrus effect on the white paper, thickening and hardening it as a result of the thickened latex, likely due to the effect of acupuncture.

This observation is similar to that of Pinto (2019), who observed a similar action of a 30% hydroalcoholic extract of *E. tirucalli* with a hardening effect upon drying the tested material. In classical literature, this action is described for *E. resinifera* and *Hevea brasiliensis* (rubber tree), both from the same family.

This preliminary observation shows that inserting a needle into the stem of E. tirucalli for 24 hours evoked a yin response in the individual E. tirucalli plant (with latex condensation), possibly mediated by long-lasting electrical signaling. Chi, or life force, is the foundation of all Taoist practices, just as electricity is the foundation of modern civilization. Without electricity, virtually every aspect of our modern lifestyle grinds to a halt. Likewise, without Chi, a person's life or life being comes to an end (Chia, 2005 apud Torquato, 2005).

Based on preliminary observations, cultivation using acupuncture as a tool suggests an elegant research model for *E. tirucalli*, a succulent species. This involves biophysical investigation, physicochemical effects, and, in this case, intervention, electrochemical mechanisms, which requires the participation of a multidisciplinary team. Furthermore, the literature shows leaves and stems exhibiting local necrosis when subjected to needle pressure and pressure. Therefore, succulents appear to be more resilient and more appropriate for investigating biological effects, both on plant development and chemical production, due to their modified stems and potential biotechnological application (Wasim et al., 2022; 2025; Delaunay Souza et al., 2023; 2023a; 2025).

From all the preliminary qualitative observations presented here, what could become an innovation in research was communicated, while a specific rational protocol is being developed for methodological repetition and clarification of the mechanism of biologic action, in this post-pandemic period.

- Environmental Effect on Star Ticks

Amblyomma cajennense is a three-host tick, meaning it requires three different animals to complete its life cycle. The larval and nymphal stages are the most important in disease transmission, as they are more difficult to detect and remove.

It is important to emphasize that Rocky Mountain Spotted Fever, a disease transmitted by this tick, can be fatal. Therefore, it is essential to take preventive measures, such as avoiding areas with high tick infestation, wearing protective clothing, and applying repellents (BR/MS, 2022; Gomes et al., 2024).

In addition to the star tick, other species such as the red dog tick (*Rhipicephalus sanguineus*) can also be found in Petropolis/RJ/Brazil, mainly in urban areas and in contact with dogs. The latter can transmit diseases such as babesiosis, ehrlichiosis, and anaplasmosis.

Despite the intriguing and promising preliminary observations, we will not continue investigating the effects of *E. tirucalli* latex on ticks.

5 LIMIT

This study was conducted during a pandemic period of social isolation. It is not possible to propose the plant chemical class detected by HPLC/UV or the mechanism involved in this probable oxidative stress, according to international literature. This stress was initially caused by immobility of likely mechanical origin, but ultimately led to the death of the parasites.

6 CONTRIBUTIONS

Although preliminary, this multidisciplinary study merited communication:

Regarding the plant biotechnological potential for use as a bioprocess, preliminary and qualitative evidence demonstrated the potential for applying this protocol with acupuncture needles, both for obtaining bioproducts in Plant Biotechnology/Bioeconomy, aiming to preserve the strength of baskets and even for the production of handicrafts for the financial survival of Indigenous peoples and traditional Eastern communities living in Brazil.

Qualitatively, it was observed that the thicker the gum/resin, the less toxic it was, and it was unable to digest propylene (IPP-5) as it usually does. There is also potential application in the bioeconomy for the recycling of materials such as paper using this resin/gum.

The raw latex was able to immobilize the ticks, which became inert eight hours later. However, the only possible explanation for the mechanical nature of the gum is that, upon drying, it was able to restrict their movement.

It also promotes the possibility of investigating some Taoist phylosophic principles, such as the movement of the vital energy known as "yin-yang."

Indeed, exposure to phytotherapy, ethnobotany, pharmacobotany, environmental bioethics, cultivation procedures rescued from ethnoknowledge, and cultivation based on ancient intercultural traditions, allowed the expansion of ecoperception (Cruz Filho et al., 2023; 2025).

As discussed by Freire Souza Silva et al (2023): Could extracurricular teaching of these ticks via the hidden curriculum contribute to education focused on diversity and sustainability?

7 CONCLUSION

Preliminary and qualitative results demonstrated the potential application of these protocols, both as a bioprocess and as a bioproduct in Plant Biotechnology, with potential applications in the bioeconomy for recycling materials, such as paper, using this resin/gum. Further trials will be conducted following a rational methodological protocol.

According to Chinese and Japanese philosophies, the universe is made of yin and yang energy. These are opposing energies that coexist and complement each other. By inserting an acupuncture needle, we can further invigorate yin or yang energy, depending on the flow of the channel or point at the time of needle insertion.

So, the complementary understanding of combining Western and Eastern perspectives may reflect an expanded and innovative perspective on research in complexity, given contemporary challenges and uncertainties.

"Thus it is said,
to him who understands heavenly joy,
that life is the work of heaven;
death is the transformation of things.
In stillness, he and yin share a single virtue;
In movement, he and yang share a single flow." – ZHUANGZIG.

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