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SIMULATION IN WOODEN FLOORING SERVICES OF CAPIRONA *(Calycophyllum spruceanum)* PLANTATIONS

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Recebido em: 15/11/2023 – Aprovado em: 15/12/2023 – Publicado em: 30/12/2023
DOI: 10.18677/EnciBio_2023D20

ABSTRACT

For capirona wood (Calycophyllum spruceanum) planted in Peru to become a good option in the flooring market, it must meet certain mechanical resistance characteristics that qualify it for this purpose. The density and hardness of the wood are the main indicators for good performance on wooden floors. In-service simulation tests are an important tool to evaluate the quality of wooden floors and, thus, in some way, anticipate their performance in use. Therefore, the objective of this work was to evaluate the behavior of capirona wood from a 20-year-old plantation for the manufacture of solid wood floors, for which in-service simulation tests were carried out (ASTM D2394-08). Evaluating the resistance to rolling load efforts, concentrated loads in small areas, the impact of falling off the steel sphere, abrasion and friction. The results determined good resistance for maximum efforts in the rolling load tests, impact upon falling of the steel sphere, abrasion and high coefficients of static and dynamic friction, and low resistance in the test of concentrated loads applied in small areas. It is concluded that capirona wood from plantations can be used in the manufacture of floors due to its good performance in most of the tests carried out.

KEYWORDS: Pau Mulato, depressions in wood, wood properties

SIMULAÇÃO EM SERVIÇOS DE PISOS DE MADEIRA EM PLANTAÇÕES DE CAPIRONA *(Calycophyllum spruceanum)*

RESUMO

Para que a madeira capirona (Calycophyllum spruceanum) plantada no Peru se torne uma boa opção no mercado de pisos, ela deve atender a determinadas características de resistência mecânica que a qualifiquem para esse fim. A densidade e a dureza da madeira são os principais indicadores de um bom desempenho como pisos de madeira. Os testes de simulação em serviço são uma importante ferramenta para avaliar a qualidade dos pisos de madeira e assim, de alguma forma, antecipar o seu desempenho em uso. Portanto, o objetivo deste estudo foi avaliar o comportamento da madeira de capirona proveniente de uma plantação com 20 anos, para fabricação de pisos de madeira maciça, para a qual foram realizados testes de simulação em serviço (ASTM D2394-08). avaliando a resistência aos esforços de carga de rolamento, cargas concentradas em pequenas áreas, impacto de queda da esfera de aço, abrasão e atrito. Os resultados determinaram boa resistência para esforços máximos nos ensaios de carga de rolamento, impacto na queda da esfera de aço, abrasão e altos coeficientes de atrito estático e dinâmico, e baixa resistência no ensaio de cargas concentradas aplicadas em pequenas áreas. Concluiu-se com este estudo que a madeira de capirona proveniente de plantações pode ser utilizada na fabricação de pisos, devido ao seu bom desempenho na maioria dos testes realizados.

PALAVRAS-CHAVE: Pau mulato, depressões em madeira, propriedades da madeira

INTRODUCTION

Today, solid wood flooring is produced in various styles, colors and cuts, offering versatile functions and designs to consumers. Wood's unique appearance and texture provide an aesthetic appeal to the floor; by its nature, it is very durable, being greater after installation. On the other hand, they require little or no routine maintenance; they do not trap dust, mold pollen, or particles, among other qualities (MORDOR INTELLIGENCE, 2022).

To select the species to use for the production of floors, the physical, mechanical properties and aesthetic attributes must be evaluated (COSTA *et al*., 2021), with one of the most important factors for choosing wood for floors being the density of the material, wood denser ones are more resistant to be used in floors, given that density is directly related to hardness (BLANCO-FLORÉZ *et al.*, 2015).

Hardness is a key mechanical property of soil performance (SEPLIARSKI *et al*., 2022), as it is commonly used to determine the suitability of a wood species for flooring applications (MILLANIYAGE *et al*., 2022). They currently compete with engineered wood floors; however, due to their high quality, better finishes can be obtained compared to different wood floors. In Peru, the main species for the manufacture of floors are those from natural forests, the most used due to their quality being shihuahuaco, estoraque, capirona, aguano masha, quina quina, quinilla, among others (SERFOR, 2021). However, this resource is increasingly scarce, given that they are a product of the extraction of native forests.

The capirona is a rapidly growing species with great potential, its wood is considered of great commercial value, mainly oriented to the construction sector, whose product in greatest demand is wooden floors (GUARIGUATA *et al*., 2017). Due to its high specific mass and hardness, it is considered a high-quality wood. It has moderately easy sawing, is moderately resistant to biological attack and is good drying; in addition, it can be used in cabinetmaking, doors, windows, moldings, dowels, shipbuilding, heavy structures, tongue and groove, bodywork, turning, sporting goods, tool handles, crafts and items that come into contact with food (SIBILLE, 2006).

In recent years, its demand at a national and international level has increased considerably, which corresponds to the production of roundwood, sawn wood and parquet (DÍAZ, 2021). It is currently ranked third in the production of parquet and floor slats (SERFOR, 2021).

On the other hand, the country has large extensions of deforested lands, which have not been valued; currently, there is accumulated deforestation between 2001 and 2021 of 2,774,562 ha (MINAM, 2022), a part of which could be used for commercial plantations for industrial purposes. The production of products in the first transformation plant, among them, wooden floors, coming from the Amazon, has been decreasing; this implies that, if current consumption is maintained, the market will resort to more imported products or the use of substitute products such as plastic, ceramics and metal among others, losing positioning in the market (LA CÁMARA, 2022). Above all, from a global market perspective, wooden floors are considered the main economic areas (SEPLIARSKY *et al*., 2022)

Therefore, considering the potential of capirona from forest plantations as a species of great importance for the production of different products, including solid wood floors, this research was carried out to evaluate the performance in service of wood floors. This species, as well as recommending its proper use.

MATERIALS AND METHODS

The study was carried out on trees from a 20-year-old experimental capirona (Calycophyllum spruceanum) plantation from the Curimaná district, Ucayali Region-Peru, at 8°24'15.11" south latitude and 75°7'14.66" west longitude. The area has a tropical climate (Af according to Köppen-Geiger), with an average temperature of 26.3°C, an altitude of 184 meters above sea level and an average annual precipitation of 2672 mm (source: CLIMATE-DATA- ORG). Six trees with straight trunks and good phytosanitary conditions were felled at random, with an average commercial height of 8.9 m, obtaining four logs per tree. The first logs from the base to the DBH were butted to a length of 1300 mm and the remaining three logs to a length of 1800 mm, which were sawn tangentially: the first log to 25 mm thick boards and a block central 100 mm thick and the remaining three to 25 mm thick boards.

Basic specific mass and Janka hardness

The central blocks of the first logs were resawned into smaller pieces and conditioned in a climate-controlled chamber until they reached equilibrium humidity conditions of approximately 12%. From this stabilized wood, test specimens were prepared to determine the basic specific mass test and Janka toughness., following standard D143 – 94 (ASTM, 2000) and standard Test Methods for Small Clear Specimens of Wood.

Simulation test of floors in service

From the dry boards, according to the manual "Manufacturing of furniture with little-known woods LKS - Industrial Processing Guide 2006 for capirona wood (SIBILLE, 2006), The specimens were prepared for the simulation tests of floors in service, then they were conditioned to an equilibrium moisture content of 12%. These tests were carried out according to standard D-2394-05 (ASTM, 2008) with adaptations. Because the capirona did not present differentiated sapwood, the specimens were grouped in two positions: Wood near the pith (CMe) and wood near the bark (CCo), which corresponded to the heartwood and sapwood, respectively (Table 1).

TABLE 1. Specifications of floor simulation tests on capirona wood

Position	Number of repetitions/tests				
	Rolling Load	Concentrated load in small areas	Steel sphere drop impact	Abrasion	Friction
Dimensions of the wooden test pieces	240 x 115 x 20 (mm)	240 x 115 x 15 (mm)	240 x 140 x 20 (mm)	95 x 95 x 10 (mm)	240 x140 x 20 (mm)
CM	30	45	72	27	35
CCo	30	45	72	27	35
Total	60	90	144	54	70

Rolling load test

The equipment used consists of an iron table 1700 x 550 mm (length x width), on which the specimens are placed at an angle of 45° between the axial axis of the fibers and the direction of movement of the load. The equipment has two side wheels and a central wheel moves between two rails. The central wheel is the one that transmits a load of 890N to the wood, moved by an electric motor that slides it over the surface at a speed of 0.06 $m.s^{-1}$ for 10, 25 and 50 trips, causing a continuous depression of the pieces that are measured using the dial gauge with a precision of 0.001 mm (Figure. 1A).

Concentrated load test in small areas

The equipment used consists of an iron table measuring 1430 x 240 mm (length x width), provided with a 150 x 235 mm mobile roller containing 225 cylindrical teeth with a diameter of 5 mm, which exerts a distributed load of 890 N, moved by an electric motor that slides over the surface at a speed of 0.06 $m.s^{-1}$, which moves over the specimens for 50 and 100 trips, causing a continuous depression of the pieces that is measured using the clock, comparator with precision of 0.001 mm (Figure. 1B).

Steel sphere drop impact test

The equipment is made up of a stainless steel tower divided into 12 heights spaced at 150 mm (150 mm to 1800 mm) and two central columns where a movable platform is located that has an electromagnet that vertically releases an impact unit consisting of a sphere, made of steel with a diameter of 51 mm and a mass of 535 g. A sheet of carbon paper is placed to visualize the impact area, facilitating the measurement of the depression caused by the sphere. The depth of the depression was obtained with the help of a dial gauge with a precision of 0.001 mm (Figure 1C).

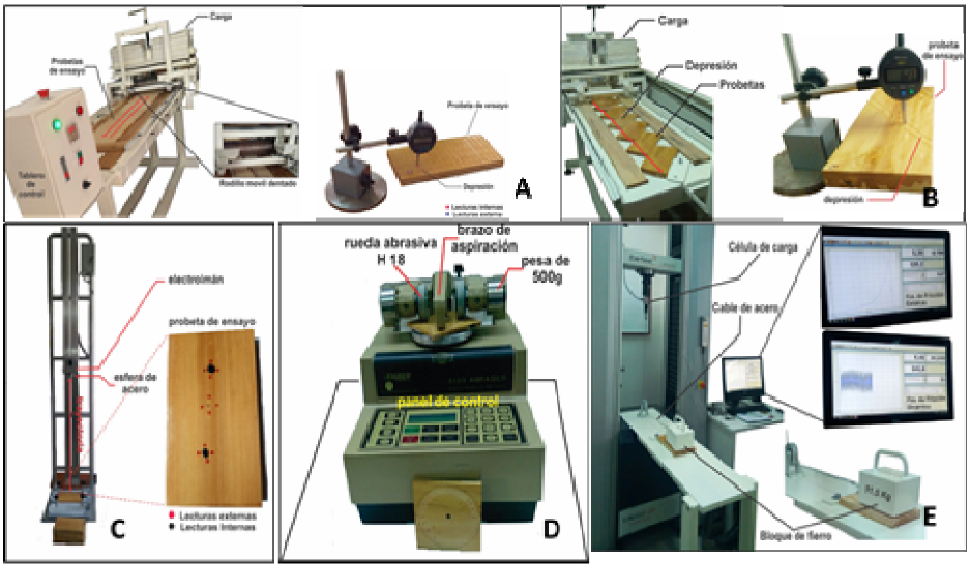
Abrasion test

This test simulates the friction of abrasive elements on the wooden surface. The test was carried out on the Taber Abraser model 5135, composed of support arms with H-18 type abrasive rollers, a particle suction arm, with loads of 500 g per arm and a rotation frequency of 72 cycles.min^{-1}, subjected to 500 abrasion cycles and a support platform for the sample. At the end of the test, eight points were measured in the area that suffered the abrasion and eight points on the original surface of the specimen, with the help of the dial indicator (0.001 mm). In each internal reading, the indentation was associated with its respective external reading, and the depression value was calculated as the difference between the arithmetic averages of the external and internal readings, following the methodology of Martins *et al*. (2013) (Figure. 1D).

Static and dynamic friction test

The test simulated the ease or difficulty in sliding the shoe sole on the wooden floor and was carried out from an iron block with a rectangular face and a mass of 11.5 kg covered on its underside by a piece of sole leather. 102 mm x 114 mm shoe size. The block is connected by a steel cable to the universal testing machine, and the entire assembly is connected to a computer for recording the forces. The force necessary to move the iron block on the specimen at a speed of 1.7 mm.min^{-1} (static friction) and an average force to keep the iron block in motion at a speed of 51 mm.min^{-1} (dynamic friction). The static friction coefficient was determined by dividing the maximum force by the mass of the parallelepiped, and the dynamic friction coefficient was determined by dividing the average force by the mass of the parallelepiped. (Figure. 1E).

FIGURE 1. Equipment used in the rolling load test (A), concentrated loads in small areas (B), impact of falling steel sphere (C), Abrasion (D) and friction (E).



Statistic analysis

Basic descriptive statistics were applied in all tests. For the depression test caused in the specimen by the fall of the steel sphere, regression analysis and the Pearson correlation coefficient (r) were used, with the linear regression model being the one that obtained the highest R^2. Analysis of variance (ANOVA) for all tests, using the general linear model and Complete Random Design (RCD), in three and two treatments. All data were compared using Tukey at 5% probability.

RESULTS AND DISCUSSION

Basic Specific Mass and Janka Hardness

The basic specific mass presented a high value, classified in group IV (0.61 – 0.75 $g.cm^{-3}$), which defines it as wood with a high specific mass (ARÓSTEGUI *et al*., 1980), a characteristic of great importance for structural uses, exterior coverings, floors, and parquet. Likewise, it presented very high values of resistance to Janka hardness, according to the classification of mechanical properties proposed by Dávalos and Bárcenas (1999). These properties of wood are very important because they will directly influence the quality of the raw material to be used in the manufacture of wooden floors (BLANCO *et al*., 2015). The basic specific mass is used as a wood quality parameter because it is correlated with various characteristics and properties in common use. In this regard, Marchesan *et al*. (2020), when studying Hovenia dulcis, observed a strong correlation between basic density and Janka hardness; that is, the higher the basic density of the wood, the greater its hardness. The hardness of a timber species is a key measure for its commercial application, such as its use in flooring or furniture, especially for civil engineering (PENG *et al*., 2016).

TABLE 2. Average values of the basic specific mass and Janka hardness of capirona wood in both positions.

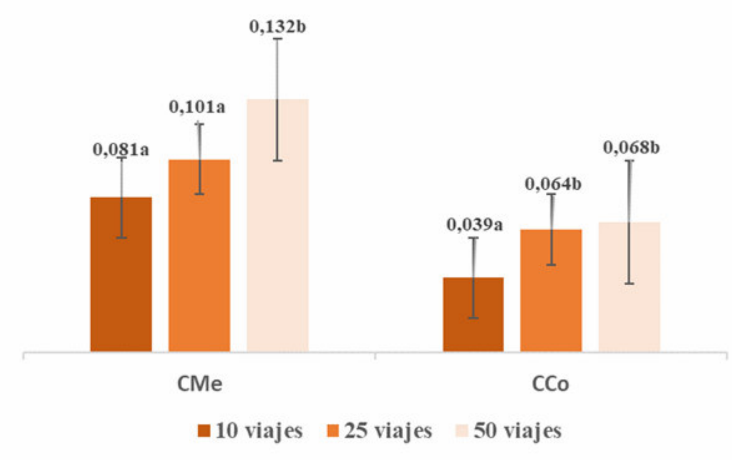
Wooden test tubes	Basic specific mass (g/cm^3)	Janka Hardness (N)
CMe	0.673 a	9,093.0 a
	(6.18)	(13.14)
CCo	0.716 b	10,882.0 b
	(2.69)	(8.15)
General average	0.69	9,988.0

Legend: The means followed by the same letter within the same column do not differ statistically at the level of 5% probability by the Tukey test; The value in parentheses indicates the coefficient of variation.

Rolling cargo

In Figure 2, it is observed that the average values of the wood in both positions increase significantly as the number of trips increases over time. In wood (CMe), the increase from trip 10 to 25 was not significant, but from trip 25 to 50 in the wood (CCo), it increased significantly until trip 25. Likewise, it can be observed that the highest depression value is presented in the wood (CMe).

FIGURE 2. Average depression values by number of trips in rolling cargo in its two positions.



Legend. The means followed by the same letter within the same block do not differ statistically at the level of 5% probability by the Tukey test.

A significant increase in the mean wood values can be seen in both positions as the number of trips increases over time. In the case of CMe wood, a significant increase is observed between trips 25 and 50, while in CCo wood, the increase is significant until trip 25. Furthermore, it stands out that CMe wood has the highest depression value. The same trend is found by Marchesan *et al*. (2020) in Hovenia dulcis by increasing the number of trips.

This progressive increase in the depression of CCo and CMe woods as the number of load trips on them increases is due to the structure of the flattened fusiform fibers in the wood. These fibers are susceptible to deformation and crushing in the direction normal to them as the load increases. This process progresses from the surface to the interior of the wood, resulting in surface wear due to the reduction of cavities in the wood (BLANCO-FLORÉZ *et al*., 2015). Thus, it is evident that the depression in capirona wood increases significantly with the increase in the number of cargo trips.

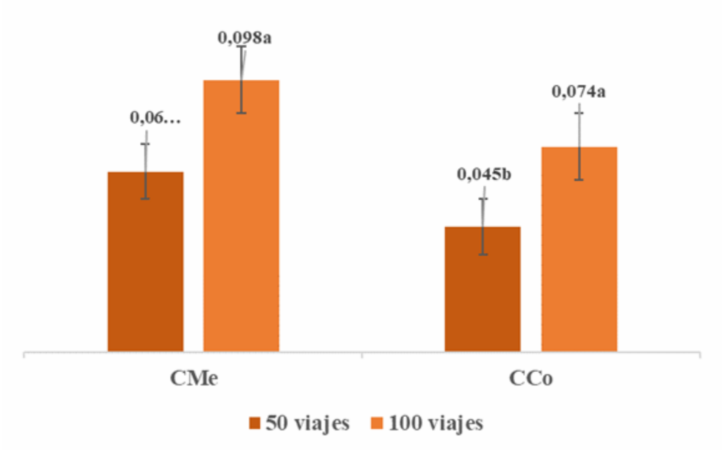
Furthermore, it is observed that CCo wood presents the lowest depression values, with 57.4% in relation to trips 10, 25, and 50, compared to 61.4% in CMe wood. This trend in both positions is consistent with the higher specific values of basic mass and hardness, indicating better performance that translates into smaller depressions, especially evident in CCo wood.

When comparing with similar research on the simulation of floors in service and considering an average reference value for 50 trips (0.10 mm and 0.673 $g.cm^{-3}$ of basic specific mass), ranges of values between 0.128 mm and 0.190 were found for Eucalyptus woods with ages between 22 and 32 years and a basic specific mass of 0.740 to 0.805 $g.cm^{-3}$ (MARTINS *et al*., 2013). This better performance of capirona in resisting rolling loads that move on its surface, despite its younger age and basic specific mass, is possibly due to genetic, climatic, or altitudinal factors. In research by Oliveira *et al*. (2019) on ipê and cumarú species, common on wooden floors, average depressions of 0.105 mm and 0.110 mm, respectively, were recorded, values similar to those of capirona. According to the classification proposed by this same author, the capirona falls in the high-quality range, which positions it as an appropriate choice for environments where frequent dragging of heavy objects is expected, whether in business, commercial, or residential environments. In this way, the capirona successfully competes with species widely used in Brazil for the manufacture of floors.

Loads concentrated in small areas

In Figure 3, it is observed that in both positions, the values experience a significant increase as the number of trips increases over time. Likewise, wood (CMe) presents the highest depression values in response to the application of concentrated loads in small areas, which is directly related to the average values of basic specific mass and Janka hardness in Table 2.

FIGURE 3. Average depression values by number of trips in concentrated cargo in small areas, in its two positions.



Legend. The means followed by the same letter within the same block do not differ statistically at the level of 5% probability by the Tukey test.

The surface of wooden floors often suffers damage caused by sharp objects, such as women's stiletto shoes, protruding nails and the like, which crush the fibers of the wood, resulting in indentations or depressions in the surface, due to microscopic regions, where The localized stress is greater than the average stress acting on the entire section (BLANCO-FLORÉZ *et al*., 2015). Hardness, which is influenced by the basic specific mass, turns out to be a useful indicator to anticipate the ability of a wood to resist the penetration of objects such as nails, knocks and dents (KHADEMIBAMI *et al*., 2022).

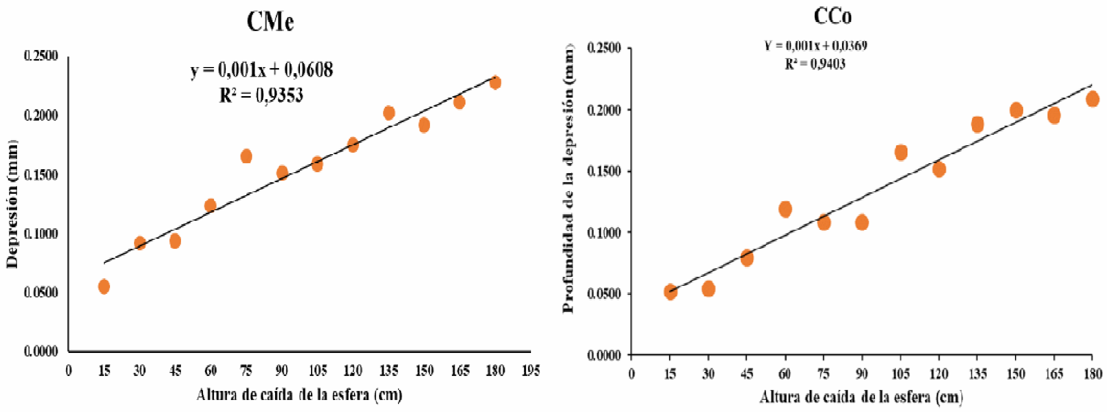
In this regard, as in the rolling load test, it is also observed that CCo wood achieves the lowest depression values, which indicates better performance. This trend can be attributed to the higher values of basic specific mass and Janka hardness in this position of the wood. Anatomical studies carried out in the investigated species reveal that the length of the fiber and the thickness of the wall increase in the direction towards the cortex (GÁLVEZ *et al*., 2020), which could explain this superior behavior in the CCo zone.

If we take as a reference point the average depression values for the capirona, with values of 0.087 mm for 100 trips, and compare them with similar research, we find that they present less depression than those recorded by Blanco-Floréz *et al*. (2015) for Tectona grandis, whose average depression is 0.100 mm. Barbosa *et al*. (2014), in their study of floors with laminated bamboo slats and pine wood panels, found average values of 0.088 mm, similar to those of capirona. On the other hand, in the research of Oliveira *et al*. (2019), mean depression values of 0.016 mm and 0.024 mm were recorded in the sucupira and amendola floors, respectively, lower depression values than those obtained in this study. In this regard, according to the qualitative classification established by standard D-2394-05 (ASTM, 2008), capirona floors would be classified within the moderate damage scale (J). Therefore, for this test, capirona wood floors could be used in environments not exposed to sharp objects.

Steel sphere drop impact test

Figure 4 shows the relationship between the depression caused by the impact of the steel sphere and the height from which the fall is made. It is observed that as the height of the drop of the sphere increases, the resulting depression in the woods (CMe) and (CCo) also increase, showing increases with a positive linear trend.

FIGURE 4. Depth of the depression as a function of the drop heights in both positions, in the steel sphere drop test.



The way in which the wooden floor responds to impact loads is determined by the interaction of various properties inherent to the wood, such as its flexibility, hardness, and resilience (GONZÁLES-TREJOS, 2012). Furthermore, a piece of wood is considered tough when it can resist significant deformations under bending or torsion before fracturing (WELLING; MILITZ, 2020). This quality translates into a high capacity to absorb energy from impacts. When the steel ball is dropped on the wooden surface, this impact energy is absorbed in the form of deformation, increasing as the distance from which the ball is released increases (BLANCO-FLORÉZ *et al*., 2015).

Table 4 shows the average depression values caused by the impact of the steel sphere. It is important to note that no statistically significant differences were found at a 5% significance level. This suggests that, for this test, the responses in both compositions are equivalent.

TABLE 4. Average values of depression depth at 180 cm drop height in both positions in the steel sphere drop test

Wooden test tubes	Depression measure (mm)	CV (%)
CMe	0.23 a	10.33
CCo	0.21 a	12.85
Overall average	0.22	

Legend: CV = Coefficient of variation; The means followed by the same letter within the same column do not differ statistically at the level of 5% probability by the Tukey test

The average depression value of 0.22 mm is observed, which was higher than the results of studies in Tectona grandis (BLANCO-FLORÉZ *et al*., 2015), which recorded depression values of 0.5 mm and of Padilha *et al*. (2006) who obtained average values of 0.468 mm in Eucalyptus wood. The researchers justified these high depression values due to the age of the species, which varied between 8 and 13 years. In agreement, Martins *et al*. (2012) reported average values of 0.21 to 0.27 mm of depression for Corymbia maculata and Eucalyptus, figures similar to those obtained in this research.

On the other hand, when compared with a study on tropical solid wood floors (COSTA *et al*., 2021), average depression values of 0.195 mm for cumarú and 0.184 mm for ipê were observed, figures higher than those obtained in this study. This can be explained by the greater specific basic mass and older age of these species, as indicated in the research. Based on the results obtained and following the classification proposed by Oliveira *et al*. (2019), it is possible to classify capirona wood as high quality in terms of resistance to the impact of the steel sphere, presenting similar characteristics to many species used in the flooring industry in Brazil.

Abrasion test

Table 5 shows the average values of the depth of the depression resulting from 500 abrasion cycles in the capirona wood samples, analyzed in both positions. Notably, the specimens in the CCo position showed a slightly better response to the abrasive effect, with a 16.6% reduction in the depression depth. Despite this result, the differences in values did not reach statistical significance.

TABLE 5. Average values of the depth of the depression in capirona wood as a result of the abrasion test for both positions

Wooden test tubes	Depression measure (mm)	CV (%)
CMe	0.060 a	34.53
CCo	0.050a	35.97
Overall average	0.050	

Legend: CV = Coefficient of variation; The means followed by the same letter within the same column do not differ statistically at the level of 5% probability by the Tukey test

Abrasion resistance refers to the ability of wood to resist wear and tear caused by use, including heavy foot traffic and the pressure exerted by various objects such as furniture and machinery, among others. This aspect is crucial to determine the useful life of the wood over time and is quantified by the reduction in the resulting thickness due to abrasion. (BLANCO-FLORÉZ *et al*., 2015).

In the capirona floors, an average surface wear value of 0.050 mm was found, which turned out to be lower than the values found by MARTINS *et al*. (2013) in C. maculata and E. microcorys, with average depressions of 0.076 and 0.073 mm, respectively and similar to the wear measured in E. cloeziana (0.055 mm). Other studies have also evaluated solid wood floors from tropical species with higher basic density, such as the one carried out by Costa *et al*. (2021), who obtained average depression values in five tropical species in the range of 0.1 mm to 0.2 mm; Similar results were obtained by Berndsen *et al*. (2014) who carried out abrasion tests on mossó bamboo (Phyllostachys pubescens) for solid floors, determining that higher densities do not always translate into greater wear resistance. In another study, Barbosa *et al*. (2014) evaluated floors composed of bamboo sheets and Edge glued panels (EPG) made of pine wood, obtaining a depression of 0.08 mm.

In general terms, capirona, despite having a lower basic density, shows certain advantages over the species investigated by Berndsen *et al*. (2014) and Costa *et al*. (2021). These advantages are manifested in its high resistance to wear and its ability to withstand abrasion stress, which makes it a favorable option for the manufacture of floors intended to withstand high pedestrian traffic.

Friction test

Table 6 shows the average values of both the static coefficient and the dynamic coefficient for both positions. It is notable that the CMe position gives the lowest value, although no significant differences are evident. It is important to note that wood in both positions guarantees greater sliding safety since it has the lowest dynamic friction coefficient. This translates into less force required to maintain movement, as mentioned in the study by Blanco-Floréz *et al*. (2015).

TABLE 6. Average values of the static and dynamic friction coefficients corresponding to capirona wood in both positions.

Wooden test tubes	Coefficient of friction	
	Static	Dynamic
CMe	0.39 a (20.8)	0.23 a (15.61)
CCo	0.46 a (15.71)	0.26 a (13.0)
Overall average	0.43	0.25

Legend: The means followed by the same letter within the same column do not differ statistically at the level of 5% probability by the Tukey test; The value in parentheses indicates the coefficient of variation.

Friction is defined as the force that opposes relative motion between two objects in contact and is intrinsically linked to the applied load. On hardwood floors, friction force represents the resistance to displacement between the hardwood floor surface and the soles of your shoes. In this sense, the static friction coefficient indicates the maximum force required to overcome the inertia of the initial movement, while the dynamic friction coefficient denotes the maximum force that hinders continuous displacement (BLAU, 2019). These friction coefficients play a crucial role in choosing the right wood species for flooring, considering their use and the level of traffic to which they will be exposed. This ensures that wooden floors offer a safe and slip-free surface (COSTA *et al*., 2019).

Capirona wood exhibits average values of 0.43 and 0.25 for the static and dynamic friction coefficients, respectively. In comparison with similar research, Blanco-Floréz *et al*. (2015) obtained static and dynamic friction coefficients for teak of 0.37 and 0.18, respectively. In the case of Padilha *et al*. (2016), when analyzing varieties of

Eucalyptus urophylla, static and dynamic friction coefficients of 0.376 and 0.230 were recorded, respectively. When studying wood floors of four species, Oliveira *et al*. (2019) identified mean values of 0.253 to 0.265 and 0.154 to 0.19 for the static and dynamic friction coefficients, respectively. On the other hand, Barbosa *et al*. (2014), when evaluating bamboo and Pinus EGP floors, determined static and dynamic friction coefficients of 0.31 and 0.24, respectively.

In this regard, in this study, the values found exceed the appropriate standards for application on floors in terms of slip resistance. A greater magnitude in the friction coefficients results in surfaces less prone to slipping, which highlights the suitability of capirona wood in the manufacture of floors. According to the criteria that qualify the quality of wooden floors proposed by Oliveira *et al*. (2019), capirona meets the requirements to be classified as high-quality wood for this test.

CONCLUSIONS

The wood studied has a specific basic mass and high Janka hardness, highly favorable qualities for the manufacture of solid wood floors.

In the impact test by falling steel sphere, abrasion, and friction, no significant differences were detected between the CMe and CCo positions of the wood.

In the rolling load and concentrated load tests in small areas, significant differences were observed between CMe and CCo wood, with CCo wood demonstrating superior performance.

In general, considering the results obtained in most of the simulation tests that imitate the conditions of floor uses, such as rolling load, impact due to falling steel spheres, abrasion, and friction, capirona wood was shown as an option of high quality. Consequently, its use is recommended in spaces with considerable traffic.

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