Objective: This research was designed to evaluate the polyphenolic content, antibacterial potency and antioxidant activity of extract and fractions from *Laggera aurita* L. (Asteraceae), a medicinal herbaceous from Burkina Faso.

Methods: Folin ciocalteau and AlCl$_3$ methods respectively were used for polyphenol contents. The antioxidant activities of the samples were evaluated by various in vitro assays like ferrous reducing antioxidant assay (FRAP), Total reducing power, 2, 2'-diphenyl-1-picrylhydrazyl (DPPH) scavenging and ABTS radical cation decolorization assays. In vitro antibacterial capacity of bioactive fractions were investigated by agar disc diffusion, micro-well dilution (MIC), Minimum Bactericidal Concentration (MBC) assay and at least the effect of the best bioactive fraction (EAF) from *Laggera aurita* L. (Asteraceae) and in combination with gentamycin against food bacterial strains multi-resistant was evaluated.

Results: Estimation of Total phenolic and flavonoids contents revealed that EAF and DCMF have the highest phenolic and flavonoid contents 62.12±0.68mgGAE and 10.56±0.29mgQE respectively. These results indicated that most of the bioactive fractions from *Laggera aurita* L. were able to inhibit Gram-positive bacteria as compared to Gram-negative bacteria. Among the samples tested for antioxidant activities, EAE and DCMF have the highest activities compared to other fractions.

Conclusion: These findings suggested that *Laggera aurita* L. is not only an important source for antibacterial component, but also a potential source of antioxidants. So, these results may be useful in explaining the medicinal applications of *Laggera aurita* L.

Keywords: *Laggera aurita* L, Bioactive fractions, Polyphenol compounds, Antioxidant and Antimicrobial properties.
2,2-diphenyl-1-picrylhydrazyl (DPPH), trichloroacetic acid, and solvents used were from Flika Chemie, Switzerland. Potassium hexacyanoferrate \([\text{K}_3\text{Fe(CN)}_6]\) was from Prolabo and ascorbic acid was from Labosi, Paris, France. All chemicals used were of analytical grade. Authentic standard, such as Gentamycin \((25\,\mu g)\) was purchased from Alkom Laboratories LTD, INT (p-piironitrotetrazolium chloride) was purchased from Sigma-Aldrich chemie (Steinheim, Germany).

**Plant materials**

*Laggera aurita* L. (Asteraceae) was collected in September 2011 in Gampela, 25 Km east of Ouagadougou, capital of Burkina Faso. The plant was identified in the Laboratory of Biology and Ecology, University of Ouagadougou, where a voucher specimen was deposited.

**Bacterial strains and antibiotics**

Ten references of food bacterial strains (Gram-positive and Gram-negative) were tested: *Ed = Bacillus cereus MADM 1561, Be = Bacillus cereus MADM 1291, Lm1 = Listeria monocytogenes 057, Ln2 = Listeria monocytogenes Scott A, S. in = Salmonella infantis SKN 557, Soro = Salmonella oranienburg SKN 1157, Sm = Salmonella: Nigeria SKN 1160, S t y = Salmonella typhimurium SKN 533, Es = Escherichia coli 8114, SKN 541, Ye = Yersinia enterocolitica 6A28 SKN 599.* All bacterial strains came from Culture Collection of Department of Food Science, Food Microbiology in Copenhagen University, Denmark [18].

**Methods**

**Preparation of extract**

The collected plant materials were dried at room temperature and crushed into a fine powder. Fifty grams \((50g)\) of powdered plant material were extracted with 80% aqueous ethanol \((500\,ml)\) in ratio 1/10 \((w/v)\) for 24 h under mechanic agitation \((SM 25\,shaker,\,Edmund\,BÜHLER,\,Germany)\) at room temperature. After filtration, ethanol was removed under reduced pressure in a rotary evaporator \((BÜCHI,\,Rotavapor\,R-200,\,Switzerland)\) at approximately 40°C and freeze-dried by Telstar Cryodos 50 freeze-dryer. The extract residues were weighed before filtration and freeze-dried. The extract residues were packed in waterproof plastic flasks and stored at 4°C until use.

The yields of different crude extract were calculated and expressed as grams of extract residues/100 g of dried plant materials.

**Fractionation**

Fifty grams \((50g)\) of powdered plant material were extracted with 80% aqueous ethanol \((500\,ml)\) in ratio 1/10 \((w/v)\) for 24 h under mechanic agitation \((SM 25\,shaker,\,Edmund\,BÜHLER,\,Germany)\) at room temperature. After filtration, ethanol was removed under reduced pressure in a rotary evaporator \((BÜCHI,\,Rotavapor\,R-200,\,Switzerland)\) at approximately 40°C. The aqueous extracts were subjected to sequential liquid-liquid extraction with oil ether, dichloromethane, ethyl acetate, and n-butanol. Each fraction was then collected and concentrated to dryness under reduced pressure to obtain oil ether fraction (OEF), dichloromethane fraction \((DCMF)\), ethyl acetate fraction \((EAF)\), and n-butanol fraction \((n-BF)\). The different fractions were freeze-dried by Telstar Cryodos 50 freeze-dryer. The fraction residues were packed in waterproof plastic flasks and stored at 4°C until use.

**Polyphenols determination of extract and fractions from *Laggera aurita* L. (Asteraceae)**

**Total phenolic content**

Total phenolics were determined by the Folin-Ciocalteu method as described by [19]. Aliquots \((125\,\mu l)\) of solution from extract or each fraction in methanol \((10\,ml)\) were mixed with 625 \(\mu l\) Folyciocalteu reagent \((0.2\,N)\). After 5 min, 500 \(\mu l\) of aqueous \(\text{Na}_2\text{CO}_3\) \((75\,g/l)\) were added and the mixture was vortexed. After 2 h of incubation in the dark at room temperature, the absorbances were measured at 760 nm against a blank \((0.5\,ml\text{Folin-Ciocalteu reagent} + 1\,ml\text{Na}_2\text{CO}_3)\). The absorbance readings were measured at 760 nm. The absorbance was taken as the extinction coefficient. The iron (III) reducing activity \((FRAP)\) was performed according to [20]. 0.5 mL of extract or each fraction \((0.625\,ml)\) and a freshly prepared \(\text{FeCl}_3\) solution \((0.125\,ml, 0.1\%\) were added. The mixture was centrifuged at 2000 \(\times g\) for 10 min. Then, the upper layer solution \((0.625\,ml)\) was mixed with distilled water \((0.625\,ml)\). The absorbance was determined at 734 nm against a blank. The absorbance was taken as extinction coefficient. The absorbance was determined at 734 nm against a blank.

**Iron (III) to iron (II) reduction activity (FRAP)**

The FRAP assay was performed according to [20]. 0.5 mL of extract or each fraction \((1\,mg/ml)\) was mixed with 1.25 mL of phosphate buffer \((0.2M, \text{pH}\,6.6)\) and 1.25 mL of aqueous potassium hexacyanoferrate \([\text{K}_3\text{Fe(CN)}_6]\), solution \((1\%)\). After 30 min incubation at 50°C, 1.25 mL of trichloroacetic acid \((10\%)\) was added and the mixture was centrifuged at 2000 \(\times g\) for 10 min. Then, the upper layer solution \((0.625\,ml)\) was mixed with distilled water \((0.625\,ml)\) and a freshly prepared \(\text{FeCl}_3\) solution \((0.125\,ml, 0.1\%)\). The absorbance was determined at 734 nm against a blank. The absorbance was taken as extinction coefficient. The absorbance was determined at 734 nm against a blank.

**In vitro antioxidant activity of extract and fractions from *Laggera aurita* L. (Asteraceae)**

**DPHY radical method**

Radical scavenging activity of each fraction was estimated against stable DPPH \((2,2\text{-diphenyl-1-picrylhydrazyl, DPPH})\) was determined with a UV-visible light spectrophotometer \((CECIL\,CE\,2041,\,CECIL\,Instruments,\,England)\). The samples were homogenized in an ultrasonic bath. 0.5 mL of aliquots which were prepared at different concentrations from each sample of extract was mixed with 1 mL of methanolic DPPH solution \((20\,mg/ml\) and after 15 min in the dark at room temperature, the decrease in absorption was measured. All experiments were performed in triplicate and expressed in mmol Ascorbic Acid Equivalent per g of extract or fraction \((Y = -16.815x+6.8373; R^2 = 0.9976))

**ABTS radical cation decolorization assay**

For ABTS radical cation decolorization assay, the procedure followed the method of [19]. ABTS was dissolved in water to a 7 mM concentration. ABTS radical cation \((ABTS^-)\) was produced by reacting ABTS stock solution with 2.45mM potassium persulfate \((CECIL\,CE\,2041,\,CECIL\,Instruments,\,England)\). For our study, we used 10 \(\mu L\) of the diluted sample \((1\,mgl^{-}\text{in methanol})\) which was allowed to react with 990 \(\mu L\) of fresh \(\text{ABTS}^-\) solution and the absorbance was taken 6 min exactly after initial mixing. Ascorbic acid was used as standard \((Y = -0.0342x+0.634; R^2 = 0.9996)\) and the capacity of free radical scavenging was expressed as mmol Ascorbic Acid Equivalent per g of extract or fraction. Quercetin, a reference compound was used as positive control.

**Iron (III) to iron (II) reduction activity (FRAP)**

The iron (III) to iron (II) reduction activity \((FRAP)\) was performed as adapted by [19]. 0.5 mL of extract or each fraction \((0.625\,ml)\) and a freshly prepared \(\text{FeCl}_3\) solution \((0.08\,ml, 0.0081\%)\). The absorbance was determined at 734 nm against a blank. The absorbance was taken as extinction coefficient. The absorbance was determined at 734 nm against a blank.

**In vitro antibacterial activity of the bioactive fractions (DMCF and EAF) from *Laggera aurita* L. (Asteraceae)**

**Preparation of inocula**

The susceptibility tests were performed by Mueller Hinton agar well diffusion method [21]. The bacterial strains grown on nutrient agar
at 37 °C for 18 h were suspended in a saline solution (0.9 %, w/v) NaCl and adjusted to a turbidity of 0.5 McFarland standard (10⁸ CFU/mL). To obtain the inocula, these suspensions were diluted 100 times in Muller Hinton broth to give 10⁶ colony forming units (CFU)/ml.

**Preparation of discs**

The stock solutions of extract or each fraction were dissolved in 10 % dimethylsulfoxide (DMSO) in water at a final concentration of 10 mg/ml. The stock solutions of extracts were sterilized by filtration through 0.22 μm sterilizing Milipore express filter. The sterile discs (6 mm) were impregnated with 10 μL of the sterile solution of extract or each fraction. Negative controls were prepared using discs impregnated with 10 % DMSO in water and commercially available antibiotic diffusion discs (gentamycin 25 μg from Alkom Laboratories LTD) were used as positive reference standards for all bacterial strains [21].

**Disc-diffusion assay**

Petri plates (9 cm) were prepared with 20 ml of a base layer of molten Mueller Hinton agar (DIFCO, Becton Dickinson, USA). Each Petri plate was inoculated with 15 μl of each bacterial suspension (10⁷ CFU/ml). After drying in a sterile hood, 6 mm diameter discs soaked with 10 μl of the different extract solution dilutions were placed on the agar. Discs containing gentamycin (25 μg) were used as positive controls and 10 % DMSO was used as a negative control. The plates were incubated for 24 h at 37 °C. The diameters of the inhibition zones were evaluated in millimeters. The extract inducing inhibition zone of 3 mm around disc were considered as antibacterial. All tests were performed in triplicate and the bacterial activity was expressed as the mean of inhibition diameters (mm) produced [21].

**Minimum inhibitory concentration (MIC)**

Minimum inhibitory concentration (MIC) was determined by the microdilution method in culture broth as recommended by [21, 22]. Eight serial two-fold dilutions of extracts or conventional antibiotic (gentamycin) were prepared as described before, to obtain final concentration range of 1000 μg/ml to 15.625 μg/ml. The last wells (n⁸) served as sterility controls (contained broth only) or negative control (broth + inoculum). The 96-well micro-plates (NUNC, Denmark) containing 100 μL of Mueller Hinton (MH) broth were used. For each bacteria strain, three columns of eight wells to the micro-plate were used. Each well has getting: the culture medium + extracts or gentamycin + inoculum (10 μl of inocula) and INT (50 μl; 0.2 mg/ml for 30 min). The plates were covered and incubated at 37 °C for 24 h. All tests were performed in triplicate and the bacterial activity was expressed as the mean of inhibitions produced. Viable microorganisms reduced the yellow dye to a pink colour. Inhibition of bacterial growth was judged by rose or yellow colour. The measurement of the inhibition diameters (mm) produced was expressed following [24].

**Minimal bactericidal concentration (MBC)**

Minimum bactericidal concentration (MBC) was recorded as a lowest extract concentration killing 99.9% of the bacterial inocula after 24 h incubation at 37°C. Each experiment was repeated at least three times. MBC values were determined by removing 100 μL of bacterial suspension from subculture demonstrating no visible growth and inoculating nutrient agar plates. Plates were incubated at 37°C for a total period of 24 h. The MBC is determined with the wells whose the concentrations are MIC [21, 23]. The MBC were determined in Mueller Hinton (MH) agar (DIFCO, Becton Dickinson, USA) medium.

**Evaluation of bactericidal and bacteriostatic capacity**

The action of an antibacterial on the bacterial strains can be characterized with two parameters such as Minimum inhibitory concentration (MIC) and Minimum bactericidal concentration (MBC). According to the ratio MBC/MIC, we appreciated antibacterial activity. If the ratio MBC/MIC = 1 or 2, the effect was considered as bacteriostatic but if the ratio MBC/MIC = 4 or 16, the effect was defined as bactericidal [23].

Evaluation of the fractional inhibitory concentration index of the best bioactive fraction (ethyl acetate rich-flavonoid fractions) in combination with gentamycin against food bacterial strains multi-resistant

The Muller Hinton agar dilution method was used to evaluate the Fractional Inhibitory Concentration Index (FICI) of flavonoid-rich fractions from *Laggera aurita* L. (Asteraceae) and the tested antimicrobial standards as reported earlier [21, 22]. Eight serial two-fold dilutions of flavonoid-rich fractions were prepared as described before, to obtain final concentration range of 1000 μg/ml to 15.625 μg/ml. A series of two-fold serial dilutions of gentamycin was also prepared in the same conditions as flavonoid-rich fractions. In this way, all antibacterial standards dilutions were mixed with the appropriate concentration of flavonoid-rich fractions thus obtaining a series of the combinations of conventional antibiotics and flavonoid-rich fractions. The concentrations prepared corresponded to 1:1/2; 1/4; 1/8; 1/16; 1/32; 1/64; of MIC values. The 96-well micro-plate (NUNC, Danemark) containing 100μL of Mueller Hinton (MH) broth were used. For each bacteria strain, three columns of eight wells to the micro-plate were used. Each well has getting: the culture medium + combination of flavonoid-rich fractions with gentamycin + inoculum (10 μl of inocula) and INT (50 μl; 0.2 mg/ml for 30 min). The plates were covered and incubated at 37 °C for 24 h. All tests were performed in triplicate and the bacterial activity was expressed as the mean of inhibitions produced. Viable microorganisms reduced the yellow dye to a pink colour. Inhibition of bacterial growth was judged by rose or yellow colour. The measurement of the inhibition diameters (mm) produced was expressed following [24].

**Statistical analysis**

The data were expressed as Mean±Standard deviation (SD) of three determinations. Statistical analysis (ANOVA with a statistical significance level set at p<0.05 and linear regression) was carried out with XLSTAT 7.1.

**RESULTS**

**Polyphenol content**

The total phenolics content per 100 mg of *laggera aurita* L. extract and fractions ranged from 62.1±0.68mgGAE to 9.07±0.17mgGAE. The highest content of total phenolics was detected in EAF with 62.12±0.68mgGAE following by DCMF with 23.67±0.5mgGAE. The lowest total phenolics were obtained in OEF with respectively 9.07±0.17mgGAE.

The total flavonoids content per 100 mg of *laggera aurita* L. extract and fractions ranged from 10.56±0.29mgQE to 1.28±0.20mgQE. The highest content of total flavonoids in *laggera aurita* L was detected in DCMF with 10.56±0.29mgQE following by EAF with 10.12±0.06mgQE. The lowest total flavonoids were obtained in OEF with respectively 1.28±0.14mgQE. The results are recorded in the (Figure 1)

**Antioxidant activity**

The measures of antioxidant activity were obtained using three described methods. Results are consigned in the (Figure 2). The reduction capacity of DPPH radicals was determined by the decrease of the absorbance induced by antioxidant at 517 nm, which is induced by antioxidant. The values of different concentrations varied respectively from (9.472 ± 0.1941 mmol AAEE/g extract to 4.907± 0.0587 mmol AAEE/g extract). From these result, the strongest DPPH activity was obtained by EAF with 9.472 ± 0.1941
mmol AAE/g extract followed by DCMF with 9.34± 0.062 mmol. AAE/g extract. The lowest activity was obtained by EAF with 4.907± 0.0587 mmol. AAE/g extract. Control compound gave 13.76±0.26 mmol AAE/g extract for Quercetin.

For ABTS assay, the following were values obtained respectively 0.78±0.083 mmol. AAE/g extract for EHA, 0.58±0.04 mmol. AAE/g extract for EAF, 2.02± 0.308 mmol. AAE/g extract for DCMF, 2.9±0.03mg AAE/100mg extracts for RAF and 1.85±1.43 GAE/100 mg extract for BF. From these result, the strongest ABTS activity was obtained by EAF with 2.9±0.03mmol. AAE/g extract followed by DCMF with 2.03± 0.308 mmol. AAE/g extract. The lowest activity was obtained by EAF with 0.58± 0.04mg GAE/100 mg extract. The reference compound is Quercetin 7.81± 0.21 mmol AAE/g extract.

Antibacterial properties

In this present study, ten bacteria strain (Gram-negative and Gram-positive bacteria) were used. The antibacterial assays were performed by the broth micro dilution methods; so that they could be qualified and quantified by inhibition zone diameters, MIC and MBC and Fractional Inhibitory Concentration Index (FICI). One noticed that the susceptibility of the bacteria to the polyphenol compounds alone and in combination with conventional antibiotic (gentamicin) varied according to microorganism. As for the micro-well dilution assay (MIC) and Minimum bactericidal concentration (MBC) of polyphenol compounds alone and in combination, result varied according to the microorganism (Table 1 and Table 2). The MIC values were ranged from 500 µg/ml to 31.25 µg/ml and for the MBC were ranged from 000 µg/ml to 62.5 µg/ml. The bactericidal and bacteriostatic effect of polyphenol compounds alone and their combination with conventional antibiotics was determined using the ratio MBC/MIC (Table 3). At last, with regard to FICI, our results indicate synergistic and additive effects between polyphenol compounds (flavonoid-rich fractions) and the conventional antibacterial (Table 4). One noticed that ethyl acetate fraction presented the best antibacterial activity than gentamicin.

DISCUSSION

Medicinal plants are an important source of antioxidants [25] and natural antioxidants increase the antioxidant capacity of the plasma and reduce the risk of certain diseases such as cancer, heart diseases and stroke [26]. The secondary metabolites like phenolics and flavonoids from plants have been reported to be potent free radical scavengers. They are found in all parts of plants such as leaves, fruits, seeds, roots ad bark [27]. There are many synthetic antioxidants in use. It is reported, however, they have several side effects, such as liver damage and carcinogenesis [28]. There is a need for more effective, less toxic and cost effective antioxidants. Medicinal plants appear to have these desired comparative advantages, hence the growing interest in natural antioxidants from plants.

The phytochemical screening revealed in this research the presence of polyphenol content, steroids and triterpenes. The presence of the metabolites in our extracts has already been reported by [10]. The results showed that EAF following DCMF presented the highest amount of polyphenol content than the other fractions. The abundance of these fractions in polyphenols may explain the traditionally use of this Asteraceae in the treatment of bacterial infections. Because polyphenols are important antibacterial activity [29]. The abundance of two fraction extracts in polyphenol content should also explain the antioxidant activity results. In effect, it is well known that, total phenolics constitute one of the major groups of compounds antioxidants [30]. Also, Phenols are very important plant constituents because of their scavenging ability due to their hydroxyl groups. The phenolic compounds may contribute directly to antioxidative action [31]. It is known that polyphenolic compounds have inhibitory effects on mutagenesis and carcinogenesis in humans when ingested up to 1 g daily from a diet rich in fruits and vegetables [32]. Phenolic and terpenic compounds from plants are known to be good natural antioxidants. The interests of phenolics are increasing in the food industry because they retard oxidative degradation of lipids and thereby improve the quality and nutritional value of food [33].

About the antioxidants properties, three methods were used for a best appreciation of our results; because a recent study demonstrates that there are differences between the test systems for the determination of the antioxidants properties [34, 35]. As a matter of fact, it is interesting to evaluate at least two or more methods. Analysis of our results shows a relationship between polyphenol content and antioxidants properties as [36, 37, 38] showed linear. These findings are in accordance with the earlier reports on total phenolic and antioxidant activity in relationship extracts [39].

Moreover, plants have been model source of medicines as they are a reservoir of chemical agents with therapeutic properties. They provide a good source of anti-infective agents, for example emetine, quinine and berberine which still remain to be highly effective instruments in the fight against microbial infections. Various publications have documented the antimicrobial activity of plant extracts [40, 41, 42]. The results obtained in this study indicate a considerable difference in antibacterial activity with extracts. The bacteriostatic and bactericidal activity could be ascribed to the presence of polyphenolic compounds. In effect, some previous studies showed that polyphenolic compounds cause inhibition of a wide range of microorganisms. Phenol is well known as a chemical antiseptic [43]. In addition, Phenolic and terpenic antimicrobial activities are well documented [44]. Polyphenols, such as tannins and flavonoids, are important antibacterial activity [45]. The antimicrobial activity of flavonoids is due to their ability to complex with extracellular and soluble protein and to complex with bacterial cell wall while that of tannins may be related to their ability to inactivate microbial adhesions, enzymes and cell envelop proteins [46].

The results indicated that most of the extracts were able to inhibit Gram-positive bacteria as compared to Gram-negative bacteria. This is further confirmed by the previous studies by [47, 48] that describe the high sensibility of Gram-positive bacteria towards plant extracts and their component. Certain authors as [49] reported that Gram-negative bacteria are more resistant to the plant-based organic extracts because the hydrophobic cell wall structure of Gram-negative is constituted essentially of a lipopolysaccharide (LPS) that blocks the penetration of hydrophobic oil and avoids the accumulation of organic extracts in target cell membrane [50]. This is the reason why Gram positive bacteria were found to be more sensitive to various extracts.

One notice that extracts are more sensible on certain bacteria strains than standard drug (gentamicin). According a study [51], a probable degree of lipophilicity might be responsible for the extracts being higher in activity than standard drugs used lipophilicity toxicity is due to the interactions with the membrane constituents and their arrangement. Considering the above, Gram-positive bacteria should be more susceptible since they have only an outer peptidoclycan layer which is not an effective permeability barrier as reported by [52]. But in this study, we found contradicting results. Bacillus cereus some Gram-positive has developed resistance to the β-lactam antibiotics due to the production of chromosomal or plasmid mediated β-lactamases or by producing penicillin binding proteins (PBPs). All the Staphylococcus aureus strains have from PBPs (PBP1 to PBP4), but MRSA express a special PBP (PBP2 or PBP2a) from the mec A gene PBP2a takes over the biosynthetic function of normal PBPs in the presence of inhibitory concentration of β-lactams because PBP2 has a decreased binding affinity to β-lactams [53]. This has resulted in the development of multidrug resistance against β-lactam and other antibiotics. In addition, the polysaccharide capsule material in some of the pathogenic microorganisms is responsible for virulence and antimicrobial resistance [54].
Table 1: Minimum Inhibitory Concentration (µg/ml) of bioactive fractions (DCMF and EAF) from *Laggera aurita* L.

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<tr>
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<tr>
<td>EAF + Gen</td>
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<td>31.25</td>
<td>31.25</td>
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</table>

The results are the means of number of the colonies ± standard deviations.

Table 2: Minimum bactericidal Concentration (µg/ml) of bioactive fractions (DCMF and EAF) from *Laggera aurita* L.

<table>
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The results are the means of number of the colonies ± standard deviations.

Table 3: Bacteriocidal/Bacteriostatic capacity of bioactive fractions (DCMF and EAF) from *Laggera aurita* L.

<table>
<thead>
<tr>
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The results are the means of number of the colonies ± standard deviations. +: bactericidal effect (MBC/MIC = 1 or 2) −: bacteriostatic effect (MBC/MIC = 4 or 16).

Table 4: Fractional Inhibitory Concentration index (FICI) of the best bioactive fraction (flavonoid-rich fractions) in combination with gentamycin against Food Bacterial strains Multi-resistants.

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<tr>
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<td>Addi</td>
<td>Addi</td>
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FICa = MIC of the combination/MICa alone; FICb = MIC of the combination/MICb alone and FICI = FICa + FICb, a = flavonoid-rich fractions; b = gentamycin. The FICI was interpreted as follows: (1) a synergistic effect when FICI ≤0.5; (2) an additive effect when FICI >0.5 and <1 and (3) an antagonistic effect when FICI >1. Syner = Synergistic, Addi= Additive, Gen = gentamycin.

Fig. 1: Polyphenol content of extract and fractions from *Laggera aurita* L.

Fig. 2: Antioxidant activity of extract and fractions from *Laggera aurita* L.

**AEE Lag:** Aqueous ethanolic extract of *Laggera aurita*, **OEE Lag:** Oil ether extract of *Laggera aurita*, **DCMF Lag:** Dchloromethane fraction of *Laggera aurita*, **EAF Lag:** ethyl acetate fraction of *Laggera aurita*, **BF Lag:** buthanolic fraction of *Laggera aurita*.

Fig. 3: Inhibition Zone Diameters (mm) of extract and fractions from *Laggera aurita* L. and conventional antibiotics (Penicillin and gentamycin).

**CONCLUSION**

This study on this Asteraceae confirms that *Laggera aurita* L. is a good candidate for antibacterial and antioxidant uses. Thus, which many explain the traditional basis of using this herbaceous in the treatment of various bacterial infections in Burkina Faso. Further pharmacological investigations are required to identify the active constituents of the plant extracts responsible for the antioxidant and antibacterial effects.

**CONFLICT OF INTERESTS**

Declared None

**ACKNOWLEDGEMENTS**

The authors thank Dr Moussa Compaoré, Prof. Martin Tiendrébéogo and Prof. Nicolas Barro from Biochemistry Department of the University of Ouagadougou for their different contributions in this study.

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