

Submission ID #: 70521

Scriptwriter Name: Kathyayani Sridharan

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Title: Green Synthesis of Magnesium Nanoparticles from Native Neotropical Savannah Plants for Scalable Nanophytocosmetic Formulations

Authors and Affiliations:

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Author Questionnaire

1. We have marked your project as author-provided footage, meaning you film the video yourself and provide JoVE with the footage to edit. JoVE will not send the videographer. Please confirm that this is correct.

☒ Correct

☐ Incorrect

2. Microscopy: Does your protocol require the use of a dissecting or stereomicroscope for performing a complex dissection, microinjection technique, or something similar? **NO**

3. Software: Does the part of your protocol being filmed include step-by-step descriptions of software usage? **YES, DONE**

4. Proposed filming date: To help JoVE process and publish your video in a timely manner, please indicate the proposed date that your group will film here: **06/26/2026**

When you are ready to submit your video files, please contact our Content Manager, [Utkarsh Khare](#).

Current Protocol Length

Number of Steps: 18

Number of Shots: 61 (5 SC)

Interviews

Authors: Please note that **the questions will not appear on screen**. Please answer in **stand-alone full sentence with sufficient context**.

Note: The statements have been lightly edited for clarity and to eliminate redundancy

INTRODUCTION:

~~REQUIRED:~~ Summarize your research focus and the main questions it aims to answer.

- 1.1. **Octávio Luiz Franco:** Our research focuses on developing sustainable magnesium nanoparticles from native Cerrado plants for cosmetic, pharmaceutical, and topical biomedical applications.

1.1.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

~~Describe the research contexts or systems in which this protocol can be applied.~~

- 1.2. **Octávio Luiz Franco:** This protocol can be applied to sustainable nanophytocosmetic development, plant-based nanoparticle synthesis, and scalable cosmetic formulation research.

1.2.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

CONCLUSION:

~~What does this protocol allow researchers to study or measure?~~

- 1.3. **Octávio Luiz Franco:** This protocol allows researchers to synthesize, characterize, and incorporate magnesium nanoparticles into stable nanophytocosmetic topical formulations.

1.3.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

~~Describe the most important consideration or challenge when performing this protocol.~~

- 1.4. **Octávio Luiz Franco:** Maintaining consistent extract composition, controlled temperature, and standardized reaction conditions is essential for reproducible nanoparticle synthesis.

1.4.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

~~How can future studies build on this work? Describe the questions or research directions that can be investigated next.~~

- 1.5. **Octávio Luiz Franco:** Future studies can investigate other Cerrado species, optimize nanoparticle properties, and evaluate clinical efficacy in topical cosmetic applications.
 - 1.5.1. INTERVIEW: Named talent says the statement above in an interview-style shot, looking slightly off-camera.

Protocol

2. Bark Extract Preparation and Antioxidant Activity Evaluation of *Stryphnodendron adstringens*

Demonstrator: Matheus Antônio Novaes

- 2.1. To begin, rinse the freshly collected bark with running water to remove soil, dust, and surface impurities [1]. Place the bark samples in an oven at 36 degrees Celsius for 72 hours [2]. Use a knife mill to grind the dried bark to obtain a fine powder [3].
 - 2.1.1. Talent rinsing bark under running water.
 - 2.1.2. Talent placing bark samples into an oven.
 - 2.1.3. Talent grinding dried bark using a knife mill.
- 2.2. Transfer 200 grams of powdered bark to an Erlenmeyer flask [1]. Add 1000 milliliters of 98 percent ethanol [2]. Seal the flask and keep it at room temperature for 72 hours protected from light, while gently agitating once every 24 hours [3].
 - 2.2.1. Talent transferring powdered bark into an Erlenmeyer flask.
 - 2.2.2. Talent adds ethanol into the flask.
 - 2.2.3. Talent sealing the flask and placing it aside.
- 2.3. Filter the extract first through a metal mesh [1] and then through cotton using a funnel to remove residual debris [2].
 - 2.3.1. Talent filtering extract through a metal mesh.
 - 2.3.2. Talent filtering again through cotton using a funnel.
- 2.4. To evaluate the antioxidant activity, prepare a 100 millimolar DPPH solution in methanol [1-TXT]. Dilute the ethanolic bark extract in methanol to obtain concentrations ranging from 0.1 percent to 5 percent volume by volume [2]. Prepare a positive control using vitamin C solutions at the same concentrations [3].
 - 2.4.1. Talent preparing 100mM DPPH solution in methanol. **TXT: DPPH: 2,2-diphenyl-1-picrylhydrazyl**
 - 2.4.2. Talent diluting the ethanolic bark extract to obtain concentrations ranging from 0.1%v/v to 5% v/v in methanol.
 - 2.4.3. Talent preparing vitamin C positive control solutions at the same concentrations.
- 2.5. Dispense 100 microliters of DPPH solution into each well of a 96-well plate [1]. Add 50 microliters of extract or vitamin C solution to each well [2]. Incubate the plate for 30 minutes at room temperature in the dark [3].

- 2.5.1. Talent dispensing DPPH solution into a 96-well plate.
- 2.5.2. Talent adding extract or vitamin C into wells.
- 2.5.3. Talent placing the plate in a dark area.
- 2.6. Measure absorbance at 515 nanometers using a spectrophotometer [1] and calculate the [2] radical scavenging activity [3].
 - 2.6.1. Talent placing the plate into a spectrophotometer.
 - 2.6.2. Representative shot of talent calculating the radical scavenging activity.
 - 2.6.3. TEXT ON A PLAIN BACKGROUND:

$$\text{Radical scavenging activity (\%)} = \frac{(\text{ABS Control DPPH} - \text{ABS Sample})}{\text{ABS Control DPPH}} \times 100$$

Where:

ABS Control = absorbance of DPPH + Methanol

ABS Sample = absorbance of DPPH + Extract

3. Cell Viability Analysis Using Normal Human Dermal Fibroblasts

Demonstrator: Liryl Silva Gasparetto

- 3.1. Culture normal human dermal fibroblasts, or NHDF (*N-H-D-F*) cells in RPMI 1640 (*R-P-M-I-sixteen forty*) medium supplemented with 10 percent fetal bovine serum and 1 percent penicillin–streptomycin [1]. Seed cells into 96-well plates at 3×10^4 cells per well and incubate for 24 hours [2]. After replacing the medium with 100 microliters of fresh medium, add 50 microliters of extract solution [3]. Incubate for 24 hours at 37 degrees Celsius with 5 percent carbon dioxide [4].
 - 3.1.1. Talent handling cultured cells in medium.
 - 3.1.2. Talent seeding cells into a 96-well plate.
 - 3.1.3. Talent adding extract after replacing medium.
 - 3.1.4. Talent placing the plate in the CO₂ incubator.
- 3.2. To assess the cell viability, add 10 microliters of MTT (*M-T-T*) solution to each well after removal of media [1-TXT]. Incubate for 4 hours to allow formazan formation [2]. Add 60 microliters of solubilization solution containing hydrochloric acid in isopropanol to dissolve the crystals [3].

Solubilization solution = v:v HCl 370 μ L + 99,630 mL C₃H₈O. **Authors: Please verify and confirm whether the isopropanol volume is in milliliters or microliters here?**

 - 3.2.1. Talent adding MTT solution into wells after removing media from wells. **TXT: MTT: 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide**
 - 3.2.2. Talent placing the plate in incubator.

3.2.3. Talent adding solubilization solution.

3.3. Measure absorbance at 540 nanometers using a spectrophotometer [1] and calculate the [2] cell viability [3].

3.3.1. Talent placing the plate into a spectrophotometer.

3.3.2. Representative shot of talent calculating the percentage cell viability.

3.3.3. TEXT ON A PLAIN BACKGROUND

Cell Viability (%) = (ABS Sample Extract/ABS Cell Control) x 100
where

ABS Cell Control = absorbance of untreated control wells containing cells and culture medium only.

ABS Sample Extract = absorbance of wells containing cells treated with the plant extract.

4. Green Synthesis and Characterization of Magnesium Nanoparticles

Demonstrator: Liryl Silva Gasparetto

4.1. Add 9890 microliters of distilled water to a sterile reaction tube [1]. Add 100 microliters of plant extract and 10 microliters of 1 molar magnesium chloride to obtain a final concentration of 10 millimolar nanoparticle suspension [2]. Mix thoroughly to homogenize the solution [3] and incubate the mixture at 75 degrees Celsius for 18 hours [4].

4.1.1. Talent adding distilled water into a reaction tube.

4.1.2. Talent adding plant extract and magnesium chloride solution.

4.1.3. Talent mixing the solution.

4.1.4. Talent placing the tube into a heating device at 75 degrees Celsius.

4.2. After cooling the mixture to room temperature, transfer approximately 750 microliters of nanoparticle suspension into a measurement cell for dynamic light scattering, or DLS (*D-L-S*) experiments [1]. Place the cell into the instrument and perform measurements at 25 degrees Celsius [2]. Acquire particle size data using an appropriate detection mode and analyze each sample in triplicate with five sub runs per measurement [3].

4.2.1. Talent transferring suspension into a measurement cell.

4.2.2. Talent placing the cell into the instrument.

4.2.3. SCREEN: 4.2.3.mp4 00:18-00:27.

- 4.3. For atomic force microscopy experiments, deposit 10 microliters of nanoparticle suspension onto freshly cleaved mica [1]. Dry the sample in a desiccator for 2 hours [2]. Gently rinse the mica sheet three times with 20 microliters of filtered distilled water [3]. Return the sample to the desiccator and allow it to dry at room temperature for an additional 2 hours [4].
 - 4.3.1. Talent depositing nanoparticle suspension on mica.
 - 4.3.2. Talent placing the sample in a desiccator.
 - 4.3.3. Talent rinsing mica sheet carefully with 20 μ L of filtered distilled water.
 - 4.3.4. Talent placing the sample back into desiccator.
- 4.4. Configure the atomic force microscope by performing instrument setup and laser alignment according to instructions [1]. Acquire surface images with a 500 by 500 nanometers scan area [2].
 - 4.4.1. SCREEN: 4.4.1.mp4 00:25-00:33.
 - 4.4.2. SCREEN: 4.4.2.mp4 00:06-00:14.

5. Formulation of Nano-Phytocosmetic and Stability Evaluation

Demonstrator: Liryl Silva Gasparetto

- 5.1. For heated phase components preparation, place a container with 29.7 grams of purified water on a magnetic stirrer and heat to 70 to 75 degrees Celsius with gentle stirring [1]. Add 0.50 grams of hydroxyethylcellulose, or HEC (*H-E-C*), gradually to the heated water while stirring to avoid clumping [2]. Then, add 3 grams of glycerin and mix until a homogeneous solution is obtained [3].
 - 5.1.1. Talent heating water on a magnetic stirrer.
 - 5.1.2. Talent adding hydroxyethylcellulose slowly.
 - 5.1.3. Talent adding glycerin and mixing.
- 5.2. To form the cool-down phase, dissolve 3 grams of niacinamide completely in 30 grams of purified water at room temperature [1]. Add 0.3 grams of low molecular weight hyaluronic acid and mix until uniform [2]. Then, add 33.3 grams of magnesium nanoparticles synthesized from *S. adstringens* and mix gently [3]. Add 0.2 grams of benzyl alcohol and dehydroacetic acid preservatives and mix [4].
 - 5.2.1. Talent dissolving 3 g of niacinamide in 30 g of water.
 - 5.2.2. Talent adding 0.3 grams of low molecular weight hyaluronic acid.
 - 5.2.3. Talent adding 33.3 grams of nanoparticles.

- 5.2.4. Talent adding 0.2 g of benzyl alcohol and dehydroacetic acid preservative and mixing.
- 5.3. Cool the heated phase to approximately 40 degrees Celsius [1]. Add the cool-down phase slowly to the heated phase while stirring [2]. Measure the pH of the formulation, ensuring a target pH of 5.0- 6.5 for serum formulations containing niacinamide [3].
 - 5.3.1. Talent allowing heated mixture to cool.
 - 5.3.2. Talent combining two phases while stirring.
 - 5.3.3. Talent measuring pH using a pH meter.
- 5.4. For preliminary stability studies up to 12 days, prepare four replicate samples of the cosmetic serum in sealed containers [1]. Subject the samples to six consecutive freeze-thaw cycles by storing at 50 degrees Celsius for 24 hours and then at minus 5 degrees Celsius for 24 hours, completing one full cycle every 48 hours [2]. After each cycle, record organoleptic characteristics by visually inspecting the formulation for changes in appearance, colour, odour, and phase separation [3]. Measure pH at room temperature using a calibrated digital pH meter [4]. Determine viscosity using a rotational viscometer according to the equipment manufacturer's instructions. [5].
 - 5.4.1. Talent filling and sealing four containers.
 - 5.4.2. Talent performing freeze-thaw of samples in temperature-controlled storage.
 - 5.4.3. Talent visually inspecting samples.
 - 5.4.4. Talent measuring pH.
 - 5.4.5. Talent measuring viscosity.
- 5.5. For accelerated stability studies up to 90 days, prepare eight samples of the cosmetic formulation [1]. Store four samples at 50 degrees Celsius and four samples at 4 degrees Celsius [2]. Evaluate samples at 0, 1, 7, 15, 30, 60, and 90 days [3]. Record organoleptic characteristics by visual inspection [4]. Measure pH and determine viscosity using appropriate instruments according to the manufacturer's instructions [5].
 - 5.5.1. Talent preparing multiple samples.
 - 5.5.2. Talent placing samples in different storage conditions.
 - 5.5.3. LAB MEDIA: 5.5.4.jpg.
 - 5.5.4. Talent inspecting samples visually.
 - 5.5.5. Talent measuring pH and viscosity.

Results

6. Results

- 6.1. Representative particle size distribution of magnesium nanoparticles, or MgNP (*M-G-N-P*), synthesized from *S. adstringens* showed a mean particle size of approximately 70 nanometers with a narrow distribution, indicating a monodisperse population [1]. In these samples, the rapid decay of the correlation curve reflects the faster Brownian motion of smaller particles [2]. In contrast, larger or more heterogeneous populations exhibit broader distributions shifted toward higher diameters [3]. In these samples, the correlation function decays more slowly because larger particles diffuse less rapidly in solution [4].
 - 6.1.1. LAB MEDIA: Figure 2A: *Video Editor: Please emphasize the figure “Small particles” and the area of blue curve with corresponding X-axis values in “Size versus intensity percent” plot.*
 - 6.1.2. LAB MEDIA: Figure 2A: *Video Editor: Please highlight the X-axis value where the blue line drops on the correlation graph.*
 - 6.1.3. LAB MEDIA: Figure 2B: *Video Editor: Please emphasize the figure “Larger particles” and the area of blue curve with corresponding X-axis values the in “size versus intensity percent” plot.*
 - 6.1.4. LAB MEDIA: Figure 2B: *Please highlight the X-axis value where the blue line drops on the correlation graph.*
- 6.2. Mixed populations may present multiple peaks or asymmetric distributions, signaling the presence of both small particles and aggregates [1]. In these samples, the correlation curve displays a complex, non-linear decay pattern reflecting the particle heterogeneity [2]. The atomic force microscopy images of MgNP showed that the nanoparticles exhibit a smooth surface and predominantly elliptical morphology, depending on the extract source [3].
 - 6.2.1. LAB MEDIA: Figure 2C: *Video Editor: Please emphasize the figure “double population” and the areas of two blue curves with X-axis values in “size versus intensity percent” plot.*
 - 6.2.2. LAB MEDIA: Figure 2C: *Video Editor: Please highlight the points of drops seen on the blue line and corresponding X-axis values on the correlation graph.*
 - 6.2.3. LAB MEDIA: Figure 3
- 6.3. The formulation stability studies of two representative serum formulations, A and B, assessed over 90 days showed a stable formulation characterized by minimal pH variation [1], consistent viscosity over time [2], and preservation of antioxidant activity [3].

- 6.3.1. LAB MEDIA: Figure 4A: *Video Editor: Please highlight the green line and the area within the dotted line simultaneously.*
- 6.3.2. LAB MEDIA: Figure 4B: *Video Editor: Please highlight the green line and the area within the dotted line simultaneously.*
- 6.3.3. LAB MEDIA: Figure 4C: *Video Editor: Please highlight the green line and the area within the dotted line simultaneously.*
- 6.4. Contrastingly, instability in the formulation is indicated by pH drift [1], reduction in viscosity [2], and loss of functional antioxidant activity [3].
 - 6.4.1. LAB MEDIA: Figure 4A: *Video Editor: Please highlight the red line and the area within the dotted line simultaneously.*
 - 6.4.2. LAB MEDIA: Figure 4B: *Video Editor: Please highlight the red line and the area within the dotted line simultaneously.*
 - 6.4.3. LAB MEDIA: Figure 4C: *Video Editor: Please highlight the red line and the area within the dotted line simultaneously.*

- 1. Erlenmeyer
Pronunciation link: <https://www.merriam-webster.com/dictionary/Erlenmeyer>
IPA: /'ɜːləŋˌmaɪər/
Phonetic Spelling: UR·luhn·my·ur
- 2. Ethanol
Pronunciation link: <https://www.merriam-webster.com/dictionary/ethanol>
IPA: /'εθəˌnɔːl/, /'εθəˌnoʊl/
Phonetic Spelling: ETH·uh·nawl, ETH·uh·nohl
- 3. Antioxidant
Pronunciation link: <https://www.merriam-webster.com/dictionary/antioxidant>
IPA: /ˌæntiˈɑːksɪdənt/, /ˌæntərˈɑːksɪdənt/
Phonetic Spelling: an·tee·OK·sih·duhnt, an·ty·OK·sih·duhnt
- 4. Methanol
Pronunciation link: <https://www.merriam-webster.com/dictionary/methanol>
IPA: /'mεθəˌnɔːl/, /'mεθəˌnoʊl/
Phonetic Spelling: METH·uh·nawl, METH·uh·nohl
- 5. 2,2-diphenyl-1-picrylhydrazyl
Pronunciation link: No confirmed link found
IPA: /tuː tuː daɪˈfɛnəl wʌn ˌpɪkrəlˈhaɪdrəzəl/
Phonetic Spelling: too·too·dy·FEN·uhl·wun·PIK·ruhl·HY·druh·zuhl

6. Ethanolic
Pronunciation link: No confirmed link found
IPA: /,ɛθəˈnɑːlɪk/
Phonetic Spelling: eth·uh·NAH·lik
7. Absorbance
Pronunciation link: <https://www.merriam-webster.com/dictionary/absorbance>
IPA: /əbˈzɔːrbəns/, /əbˈsɔːrbəns/
Phonetic Spelling: ub·ZOR·buhns, ub·SOR·buhns
8. Spectrophotometer
Pronunciation link: <https://www.merriam-webster.com/dictionary/spectrophotometer>
IPA: /,spektroʊfəˈtɑːmɪtər/
Phonetic Spelling: spek·troh·fuh·TAH·muh·tur
9. Fibroblasts
Pronunciation link: <https://www.merriam-webster.com/dictionary/fibroblast>
IPA: /ˈfaɪbrəˌblæsts/, /ˈfɪbrəˌblæsts/
Phonetic Spelling: FY·bruh·blasts, FIH·bruh·blasts
10. Penicillin
Pronunciation link: <https://www.merriam-webster.com/dictionary/penicillin>
IPA: /,penəˈsɪlɪn/
Phonetic Spelling: pen·uh·SIL·in
11. Streptomycin
Pronunciation link: <https://www.merriam-webster.com/dictionary/streptomycin>
IPA: /,streptəˈmaɪsɪn/
Phonetic Spelling: strep·toh·MY·sin
12. Formazan
Pronunciation link: No confirmed link found
IPA: /ˈfɔːrməzæn/
Phonetic Spelling: FOR·muh·zan
13. Solubilization
Pronunciation link: No confirmed link found
IPA: /,səˌljəbələˈzeɪʃən/
Phonetic Spelling: sol·yuh·buh·luh·ZAY·shuhn
14. Hydrochloric
Pronunciation link: <https://www.merriam-webster.com/dictionary/hydrochloric>
IPA: /,haɪdrəˈklɔːrɪk/
Phonetic Spelling: hy·druh·KLOR·ik
15. Isopropanol
Pronunciation link: <https://www.merriam-webster.com/dictionary/isopropanol>
IPA: /,aɪsoʊˈproʊpəˌnɔːl/
Phonetic Spelling: eye·soh·PROH·puh·nawl
16. Magnesium
Pronunciation link: <https://www.merriam-webster.com/dictionary/magnesium>
IPA: /mæɡˈniːziəm/
Phonetic Spelling: mag·NEE·zee·uhm

17. Nanoparticles
Pronunciation link: <https://www.merriam-webster.com/dictionary/nanoparticle>
IPA: /'nænəʊˌpɑːrtɪkəlz/
Phonetic Spelling: NAN·oh·par·tih·kuhlz
18. Homogenize
Pronunciation link: <https://www.merriam-webster.com/dictionary/homogenize>
IPA: /hə'mɑːdʒəˌnaɪz/
Phonetic Spelling: huh·MAH·juh·nyze
19. Microscopy
Pronunciation link: <https://www.merriam-webster.com/dictionary/microscopy>
IPA: /maɪ'kraːskəpi/
Phonetic Spelling: my·KRAH·skuh·pee
20. Desiccator
Pronunciation link: <https://www.merriam-webster.com/dictionary/desiccator>
IPA: /'dɛsɪˌkeɪtər/
Phonetic Spelling: DES·ih·kay·tur
21. Hydroxyethylcellulose
Pronunciation link: No confirmed link found
IPA: /haɪˌdrɑːksiˌɛθəl'sɛljələʊs/
Phonetic Spelling: hy·DROK·see·eth·uhl·SEL·yuh·lohs
22. Niacinamide
Pronunciation link: No confirmed link found
IPA: /ˌnaɪəˈsɪnəˈmaɪd/
Phonetic Spelling: ny·uh·sin·uh·MYDE
23. Hyaluronic
Pronunciation link: <https://www.merriam-webster.com/dictionary/hyaluronic>
IPA: /ˌhaɪələˈrɑːnɪk/
Phonetic Spelling: hy·uh·luh·RAH·nik
24. Dehydroacetic
Pronunciation link: No confirmed link found
IPA: /diˌˈhaɪdrəʊəˈsiːtɪk/
Phonetic Spelling: dee·hy·droh·uh·SEE·tik
25. Organoleptic
Pronunciation link: <https://www.merriam-webster.com/dictionary/organoleptic>
IPA: /ˌɔːrgənəʊˈleptɪk/, /ɔːrˌɡænəˈleptɪk/
Phonetic Spelling: or·guh·noh·LEP·tik, or·GAN·uh·LEP·tik
26. Viscosity
Pronunciation link: <https://www.merriam-webster.com/dictionary/viscosity>
IPA: /vɪ'skɑːsəti/
Phonetic Spelling: vih·SKAH·suh·tee
27. Viscometer
Pronunciation link: <https://www.merriam-webster.com/dictionary/viscometer>
IPA: /vɪ'skɑːmətər/
Phonetic Spelling: vih·SKAH·muh·tur

28. Monodisperse
Pronunciation link: <https://www.merriam-webster.com/dictionary/monodisperse>
IPA: /ˌmɑːnɒdɪˈspɜːs/
Phonetic Spelling: mon·oh·dih·SPURS
29. Heterogeneous
Pronunciation link: <https://www.merriam-webster.com/dictionary/heterogeneous>
IPA: /ˌhetərəˈdʒiːniəs/
Phonetic Spelling: het·uh·ruh·JEE·nee·uhs
30. Brownian
Pronunciation link: <https://www.merriam-webster.com/dictionary/Brownian>
IPA: /ˈbraʊniən/
Phonetic Spelling: BROW·nee·uhn
31. Asymmetric
Pronunciation link: <https://www.merriam-webster.com/dictionary/asymmetric>
IPA: /ˌeɪsəˈmetrɪk/
Phonetic Spelling: ay·suh·MET·rik
32. Aggregates
Pronunciation link: <https://www.merriam-webster.com/dictionary/aggregate>
IPA: /ˈæɡrɪɡəts/
Phonetic Spelling: AG·rih·guhts
33. Morphology
Pronunciation link: <https://www.merriam-webster.com/dictionary/morphology>
IPA: /mɔːrˈfɑːlədʒi/
Phonetic Spelling: mor·FAH·luh·jee
34. Elliptical
Pronunciation link: <https://www.merriam-webster.com/dictionary/elliptical>
IPA: /ɪˈlɪptɪkəl/
Phonetic Spelling: ih·LIP·tih·kuhl