

Ultrasonidos de Plantas

Inteligencia Vegetal e IA



estampa

LA CASA ENCENDIDA



Javier Forment
27 Nov 2025



Ceguera hacia las plantas (*plant blindness*)

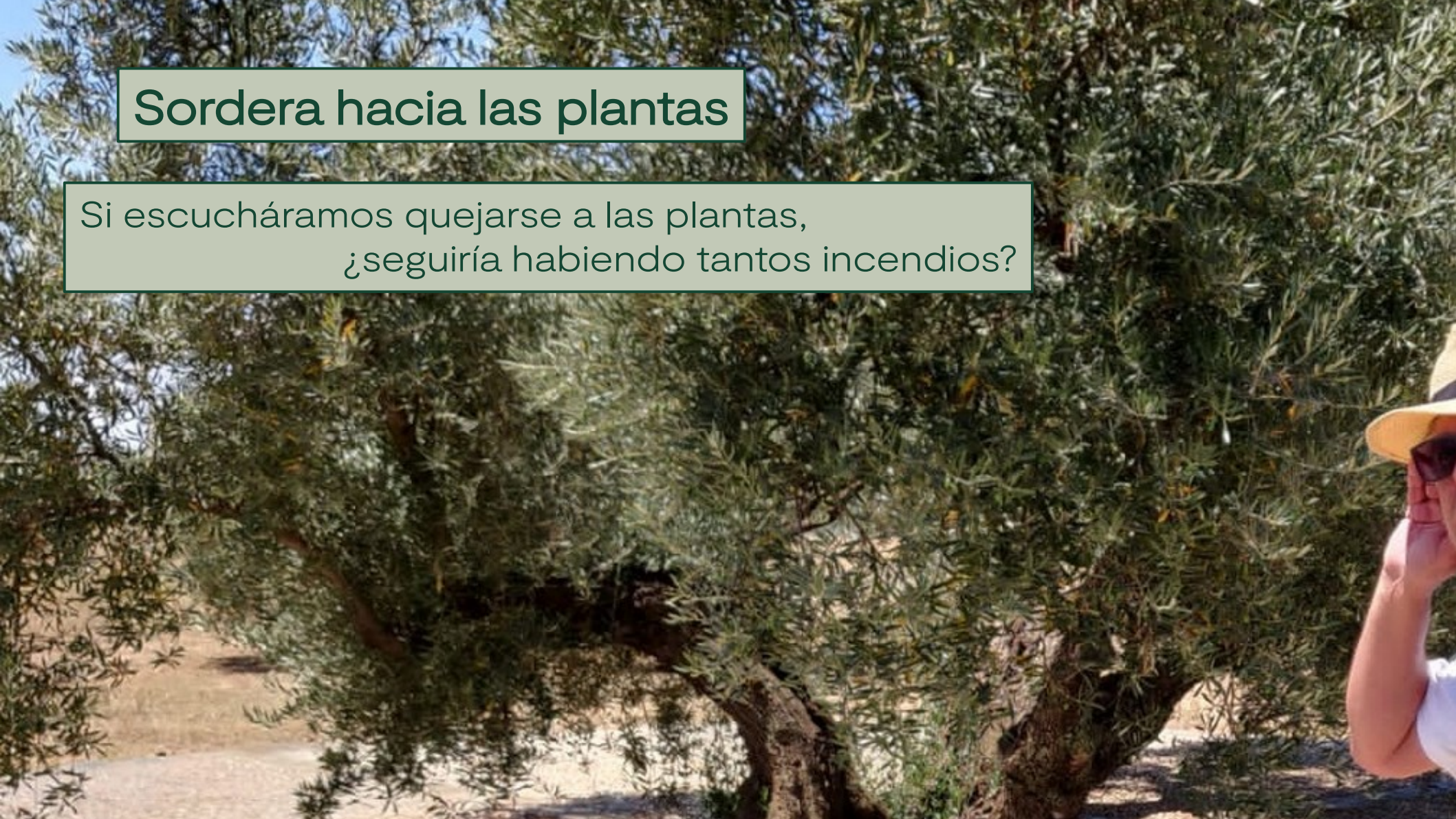


Sordera hacia las plantas



Sordera hacia las plantas

Si escucháramos quejarse a las plantas,
¿seguiría habiendo tantos incendios?



Sordera hacia las plantas

Si escucháramos quejarse a las plantas,
¿seguiría habiendo tantos incendios?

Si escucháramos y entiendiéramos sus diálogos,
¿seguiríamos considerándolas no inteligentes?



Sordera hacia las plantas

Si escucháramos quejarse a las plantas,
¿seguiría habiendo tantos incendios?

Si escucháramos sus diálogos,
¿seguiríamos considerándolas no inteligentes?

¿Y si la arrogancia del antropocentrismo y el extractivismo
no fuera más que una mera limitación sensorial?



Escuchar

LA CASA ENCENDIDA



La Casa Encendida, Maru Serrano, 2025

**Verbos encendidos #1:
Escuchar**

Escuchar a las Plantas
Atlas Sonoro para (Re)Conocer Otras Inteligencias



ibmcp
Instituto de Biología Molecular
y Celular de Plantas

VRAIN
Valencian Research Institute
for Artificial Intelligence

estampa

Con apoyo de:
Cafasso
Daniel & Nina

Escuchar

(Re)Conocer al otro

LA CASA ENCENDIDA



La Casa Encendida, Maru Serrano, 2025

**Verbos encendidos #1:
Escuchar**

Escuchar a las Plantas
Atlas Sonoro para (Re)Conocer Otras Inteligencias

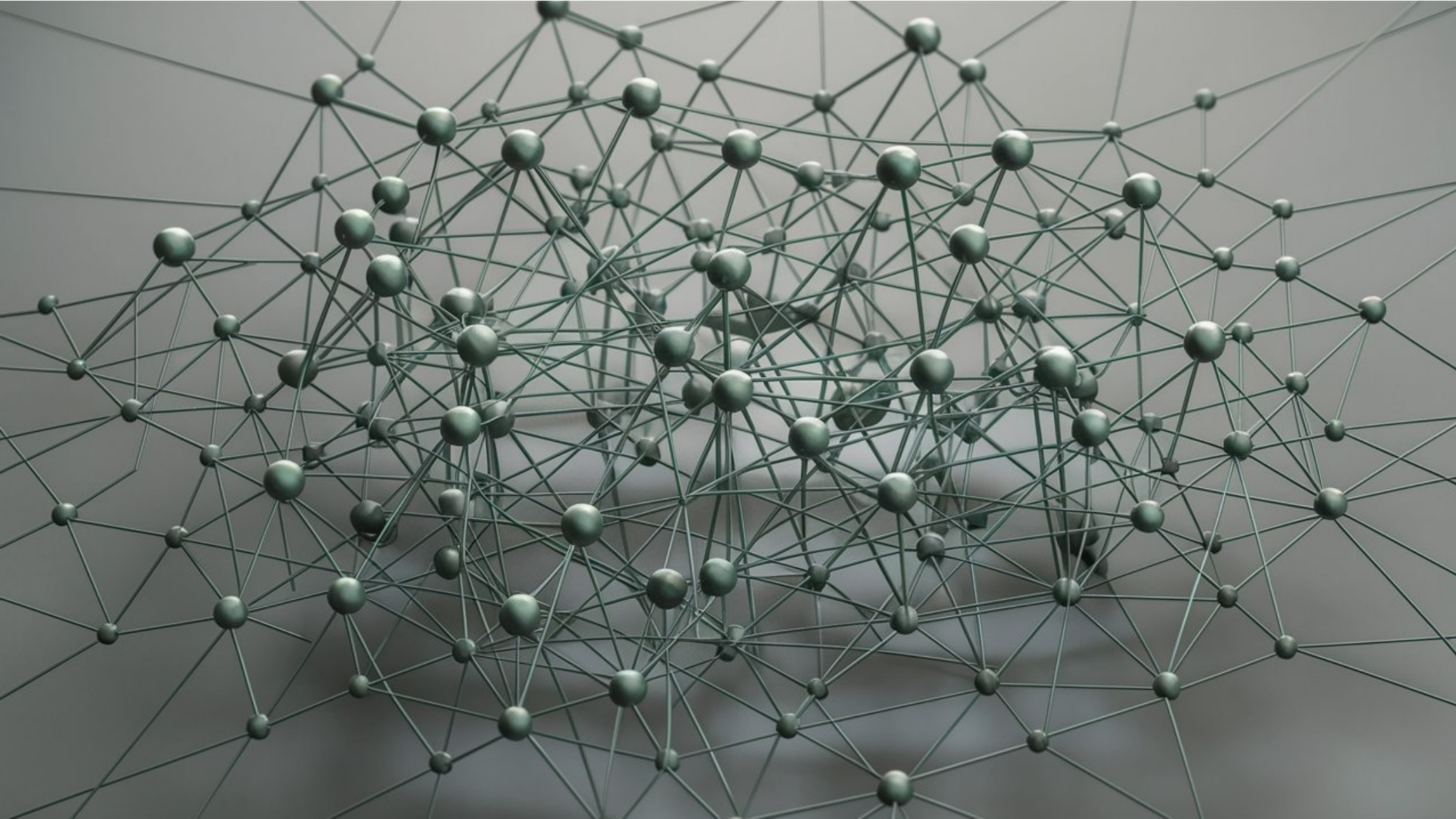


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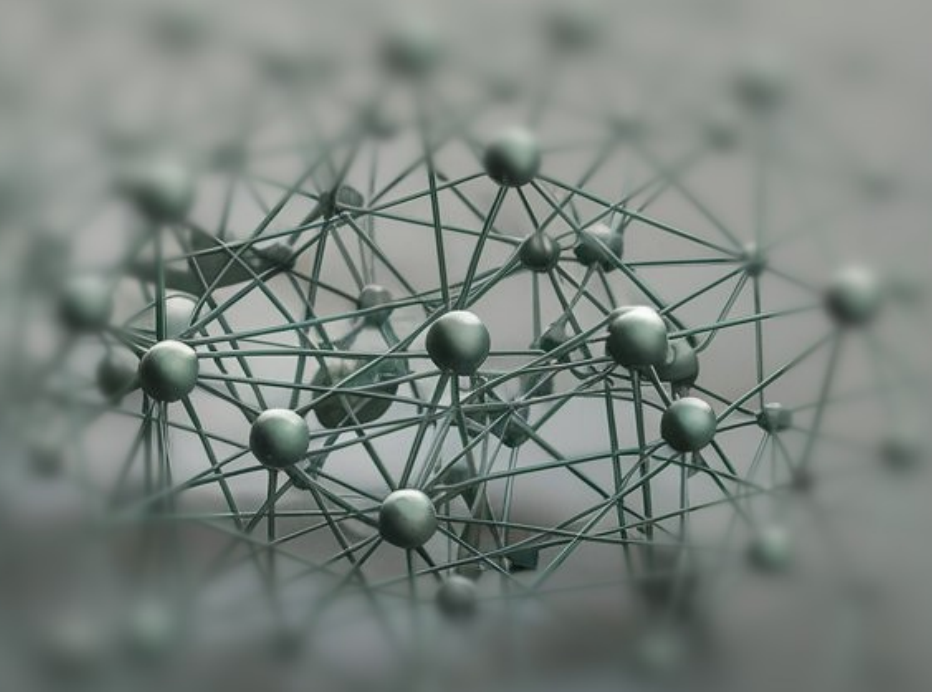
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Con apoyo de:
Catasa
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Umwelt





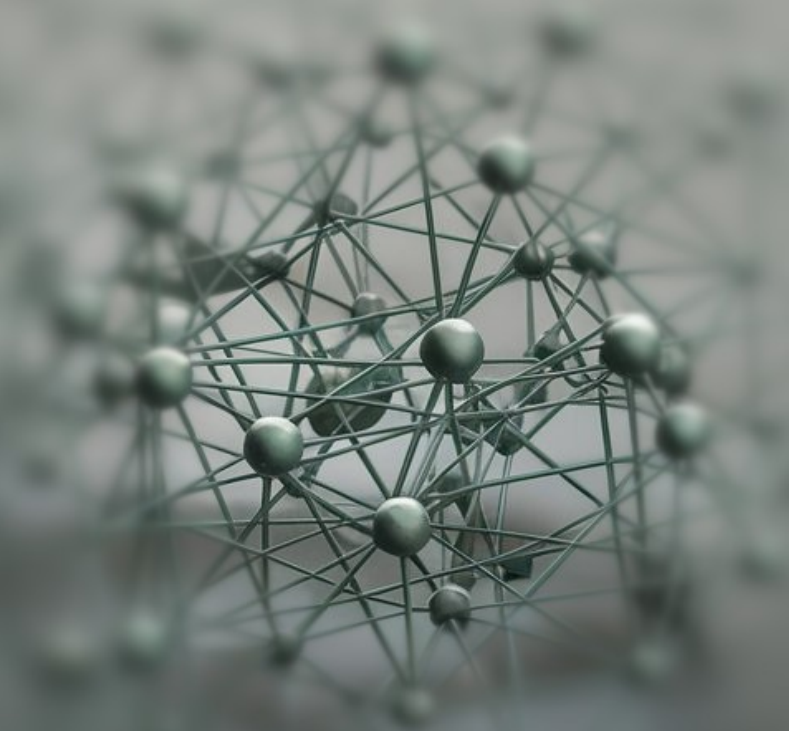
Umwelt



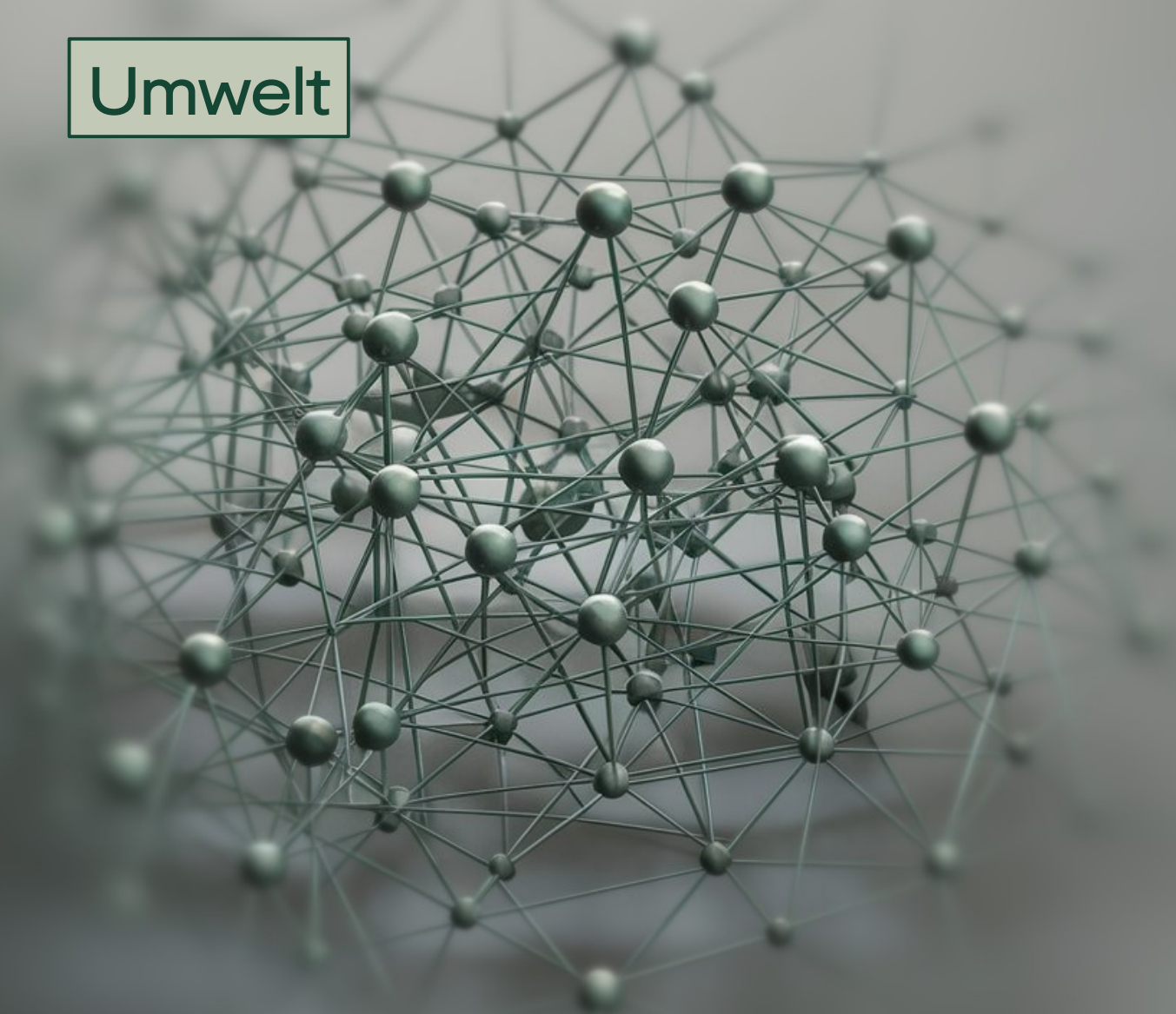




Umwelt



Umwelt



Reciclamiento de parientes

What is cognitive? **Jonny Lee**

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Abstract There is growing evidence that plants can communicate with each other via root systems and volatile organic compounds (VOCs). This communication can be used to defend against herbivores and pathogens, and to attract beneficial organisms. Plants can also communicate with each other via root systems and VOCs to coordinate their growth and development. This communication can be used to defend against herbivores and pathogens, and to attract beneficial organisms. Plants can also communicate with each other via root systems and VOCs to coordinate their growth and development.

Out of Sight but Not Out of Mind: Communication in the Plant Kingdom

Monica Gagliano^{1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49,50,51,52,53,54,55,56,57,58,59,60,61,62,63,64,65,66,67,68,69,70,71,72,73,74,75,76,77,78,79,80,81,82,83,84,85,86,87,88,89,90,91,92,93,94,95,96,97,98,99,100,101,102,103,104,105,106,107,108,109,110,111,112,113,114,115,116,117,118,119,120,121,122,123,124,125,126,127,128,129,130,131,132,133,134,135,136,137,138,139,140,141,142,143,144,145,146,147,148,149,150,151,152,153,154,155,156,157,158,159,160,161,162,163,164,165,166,167,168,169,170,171,172,173,174,175,176,177,178,179,180,181,182,183,184,185,186,187,188,189,190,191,192,193,194,195,196,197,198,199,200,201,202,203,204,205,206,207,208,209,210,211,212,213,214,215,216,217,218,219,220,221,222,223,224,225,226,227,228,229,230,231,232,233,234,235,236,237,238,239,240,241,242,243,244,245,246,247,248,249,250,251,252,253,254,255,256,257,258,259,260,261,262,263,264,265,266,267,268,269,270,271,272,273,274,275,276,277,278,279,280,281,282,283,284,285,286,287,288,289,290,291,292,293,294,295,296,297,298,299,300,301,302,303,304,305,306,307,308,309,310,311,312,313,314,315,316,317,318,319,320,321,322,323,324,325,326,327,328,329,330,331,332,333,334,335,336,337,338,339,340,341,342,343,344,345,346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393,394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417,418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465,466,467,468,469,470,471,472,473,474,475,476,477,478,479,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502,503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526,527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,561,562,563,564,565,566,567,568,569,570,571,572,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588,589,590,591,592,593,594,595,596,597,598,599,600,601,602,603,604,605,606,607,608,609,610,611,612,613,614,615,616,617,618,619,620,621,622,623,624,625,626,627,628,629,630,631,632,633,634,635,636,637,638,639,640,641,642,643,644,645,646,647,648,649,650,651,652,653,654,655,656,657,658,659,660,661,662,663,664,665,666,667,668,669,670,671,672,673,674,675,676,677,678,679,680,681,682,683,684,685,686,687,688,689,690,691,692,693,694,695,696,697,698,699,700,701,702,703,704,705,706,707,708,709,710,711,712,713,714,715,716,717,718,719,720,721,722,723,724,725,726,727,728,729,730,731,732,733,734,735,736,737,738,739,740,741,742,743,744,745,746,747,748,749,750,751,752,753,754,755,756,757,758,759,760,761,762,763,764,765,766,767,768,769,770,771,772,773,774,775,776,777,778,779,780,781,782,783,784,785,786,787,788,789,790,791,792,793,794,795,796,797,798,799,800,801,802,803,804,805,806,807,808,809,810,811,812,813,814,815,816,817,818,819,820,821,822,823,824,825,826,827,828,829,830,831,832,833,834,835,836,837,838,839,840,841,842,843,844,845,846,847,848,849,850,851,852,853,854,855,856,857,858,859,860,861,862,863,864,865,866,867,868,869,870,871,872,873,874,875,876,877,878,879,880,881,882,883,884,885,886,887,888,889,890,891,892,893,894,895,896,897,898,899,900,901,902,903,904,905,906,907,908,909,910,911,912,913,914,915,916,917,918,919,920,921,922,923,924,925,926,927,928,929,930,931,932,933,934,935,936,937,938,939,940,941,942,943,944,945,946,947,948,949,950,951,952,953,954,955,956,957,958,959,960,961,962,963,964,965,966,967,968,969,970,971,972,973,974,975,976,977,978,979,980,981,982,983,984,985,986,987,988,989,990,991,992,993,994,995,996,997,998,999,1000,1001,1002,1003,1004,1005,1006,1007,1008,1009,1010,1011,1012,1013,1014,1015,1016,1017,1018,1019,1020,1021,1022,1023,1024,1025,1026,1027,1028,1029,1030,1031,1032,1033,1034,1035,1036,1037,1038,1039,1040,1041,1042,1043,1044,1045,1046,1047,1048,1049,1050,1051,1052,1053,1054,1055,1056,1057,1058,1059,1060,1061,1062,1063,1064,1065,1066,1067,1068,1069,1070,1071,1072,1073,1074,1075,1076,1077,1078,1079,1080,1081,1082,1083,1084,1085,1086,1087,1088,1089,1090,1091,1092,1093,1094,1095,1096,1097,1098,1099,1100,1101,1102,1103,1104,1105,1106,1107,1108,1109,1110,1111,1112,1113,1114,1115,1116,1117,1118,1119,1120,1121,1122,1123,1124,1125,1126,1127,1128,1129,1130,1131,1132,1133,1134,1135,1136,1137,1138,1139,1140,1141,1142,1143,1144,1145,1146,1147,1148,1149,1150,1151,1152,1153,1154,1155,1156,1157,1158,1159,1160,1161,1162,1163,1164,1165,1166,1167,1168,1169,1170,1171,1172,1173,1174,1175,1176,1177,1178,1179,1180,1181,1182,1183,1184,1185,1186,1187,1188,1189,1190,1191,1192,1193,1194,1195,1196,1197,1198,1199,1200,1201,1202,1203,1204,1205,1206,1207,1208,1209,1210,1211,1212,1213,1214,1215,1216,1217,1218,1219,12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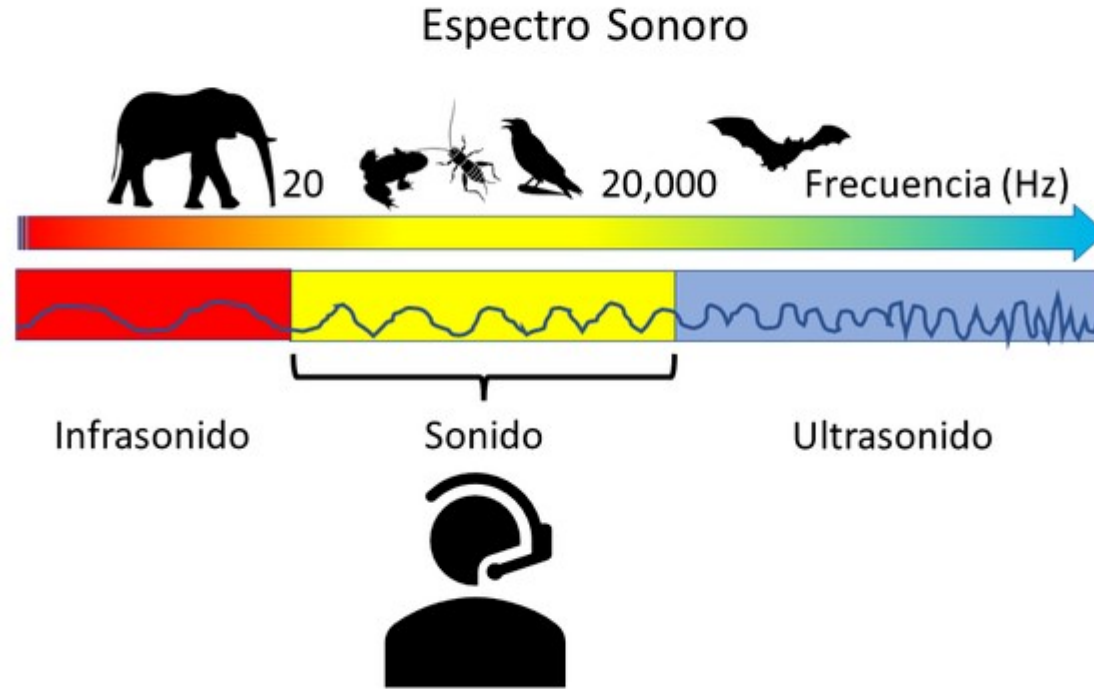
¿Es posible **escuchar** a las plantas?



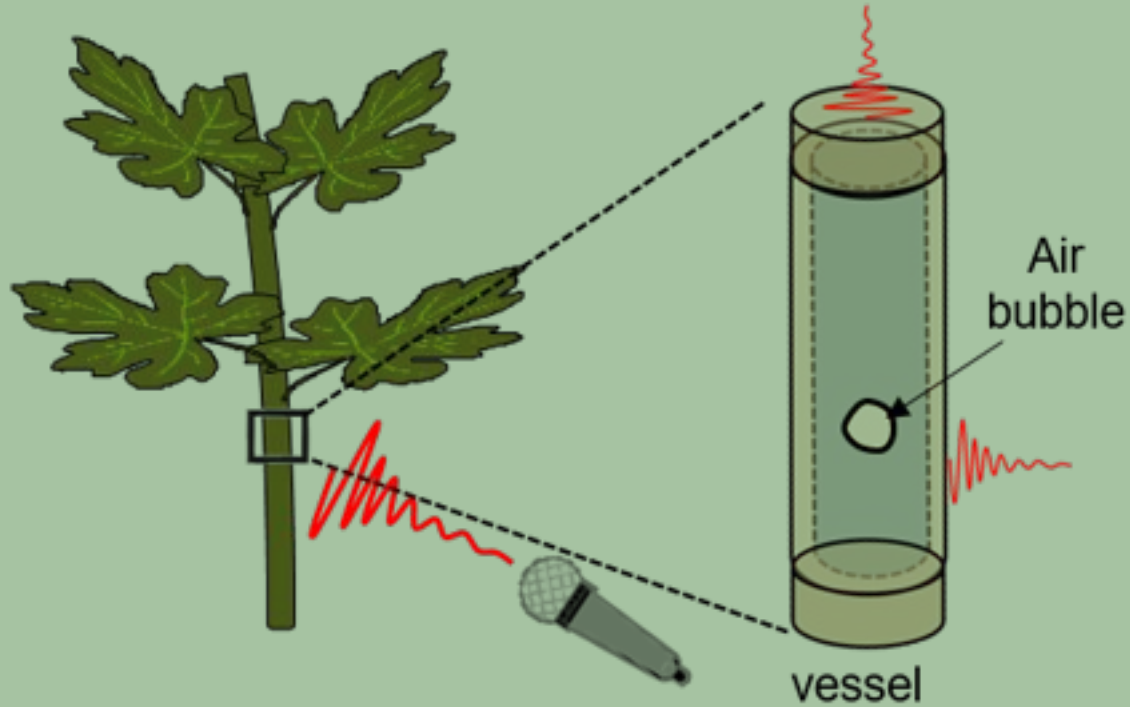
Las plantas emiten **ultrasonidos**



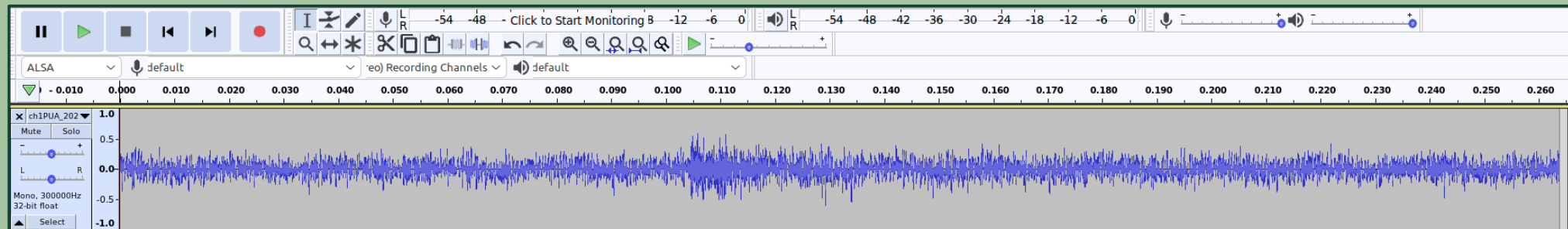
Los ultrasonidos son inaudibles para el ser humano



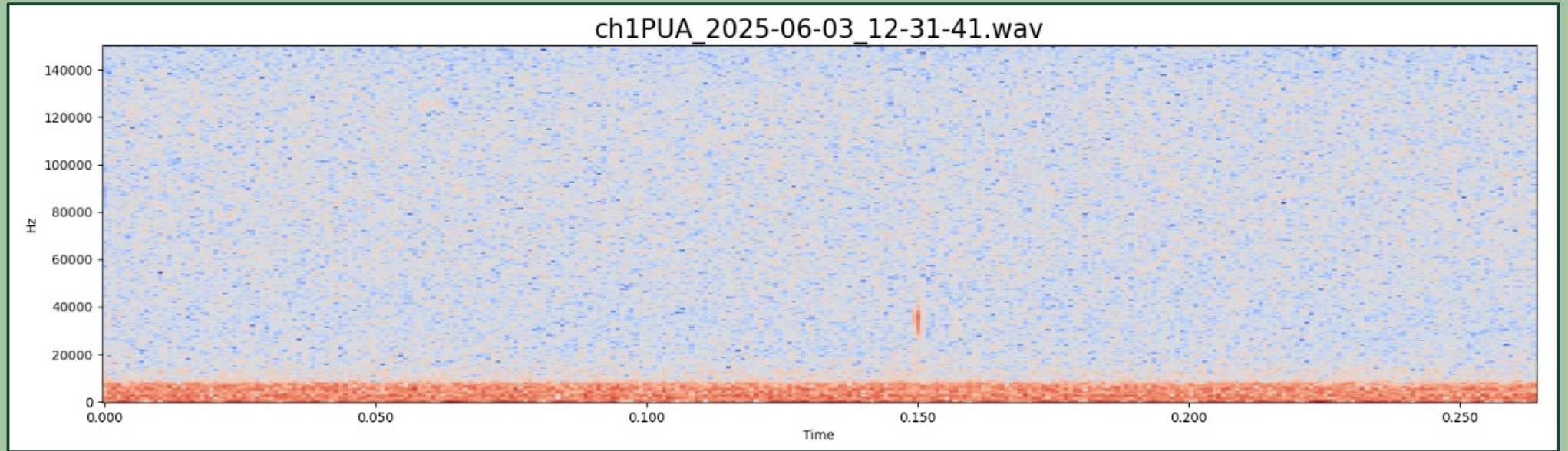
Las plantas emiten **ultrasonidos** por cavitación del xilema



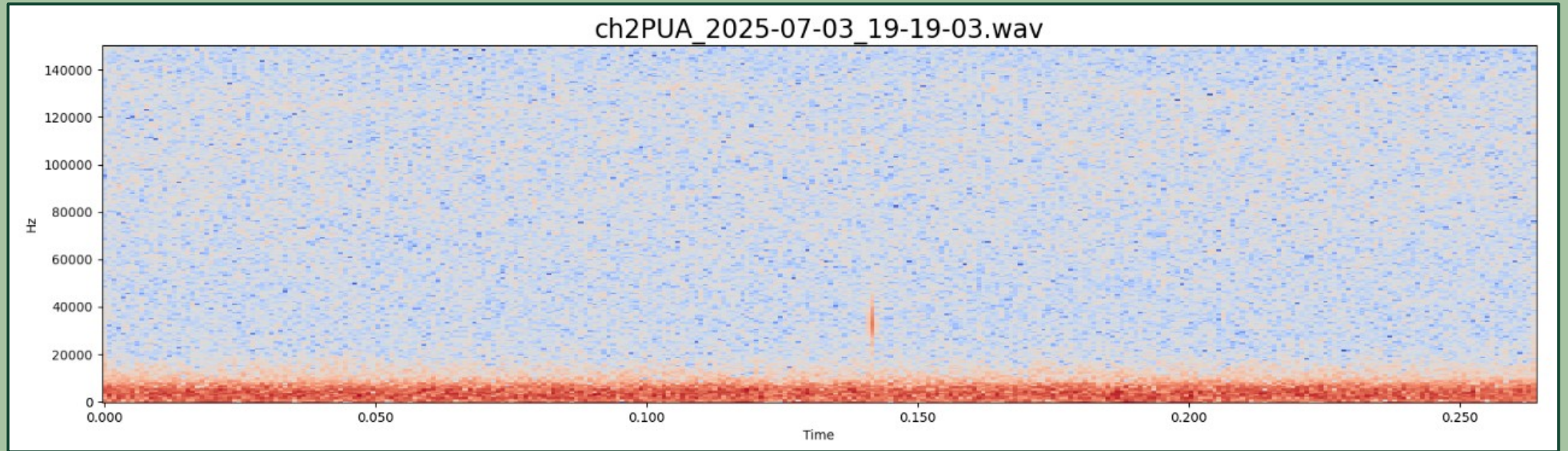
Ejemplos de ultrasonidos emitidos por plantas



Ejemplos de ultrasonidos emitidos por plantas



Ejemplos de ultrasonidos emitidos por plantas



Ejemplos de ultrasonidos emitidos por plantas

Ciencia y sociedad

Las polillas aprovechan los ultrasonidos vegetales para elegir dónde poner sus huevos

Interpretan señales de estrés hídrico de las plantas como pistas para decidir la oviposición



Cuando las plantas de tomate pasan sed, emiten clics ultrasónicos inaudibles para nosotros. Las polillas hembra no solo los oyen: los usan como pista para decidir dónde ovipositar.

Escuchar a las Plantas

Atlas Sonoro para (Re)Conocer Otras Inteligencias



@PUAproject

Plant
Ultra-
sound

PUA Atlas

ibmcp
Instituto de Biología Molecular
y Celular de Plantas

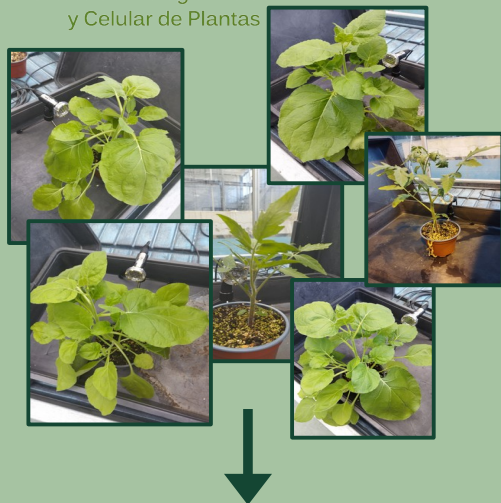
VRain
Valencian Research Institute
for Artificial Intelligence

estampa

Con apoyo de:
Carasso
Daniel&Nina

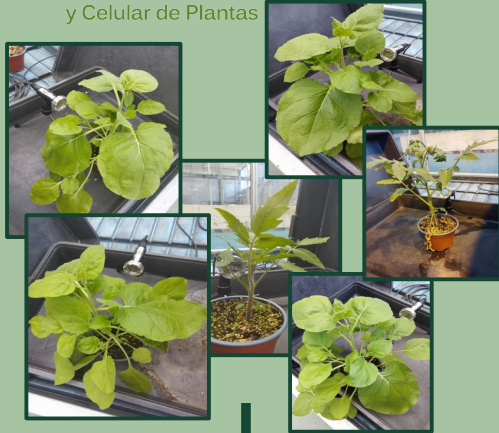


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y Celular de Plantas





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y Celular de Plantas



Plant Ultra- sound **PUA** Atlas

Metadatos

- día, hora, minutos y segundos exactos
- nombre de la especie
- variedad
- genotipo
- edad de la planta
- tiempo desde el último riego
- temperatura del aire
- temperatura de la tierra
- humedad del aire
- humedad de la tierra
- pH de la tierra
- nivel de CO₂ junto a la planta
- intensidad lumínica ambiental
- conductividad eléctrica de la tierra
- presión atmosférica





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Plant
Ultra-
sound **PUA** Atlas

VRAIN

Valencian Research Institute
for Artificial Intelligence

Machine Learning Process





Instituto de Biología Molecular
y Celular de Plantas



Machine Learning Process



estampa

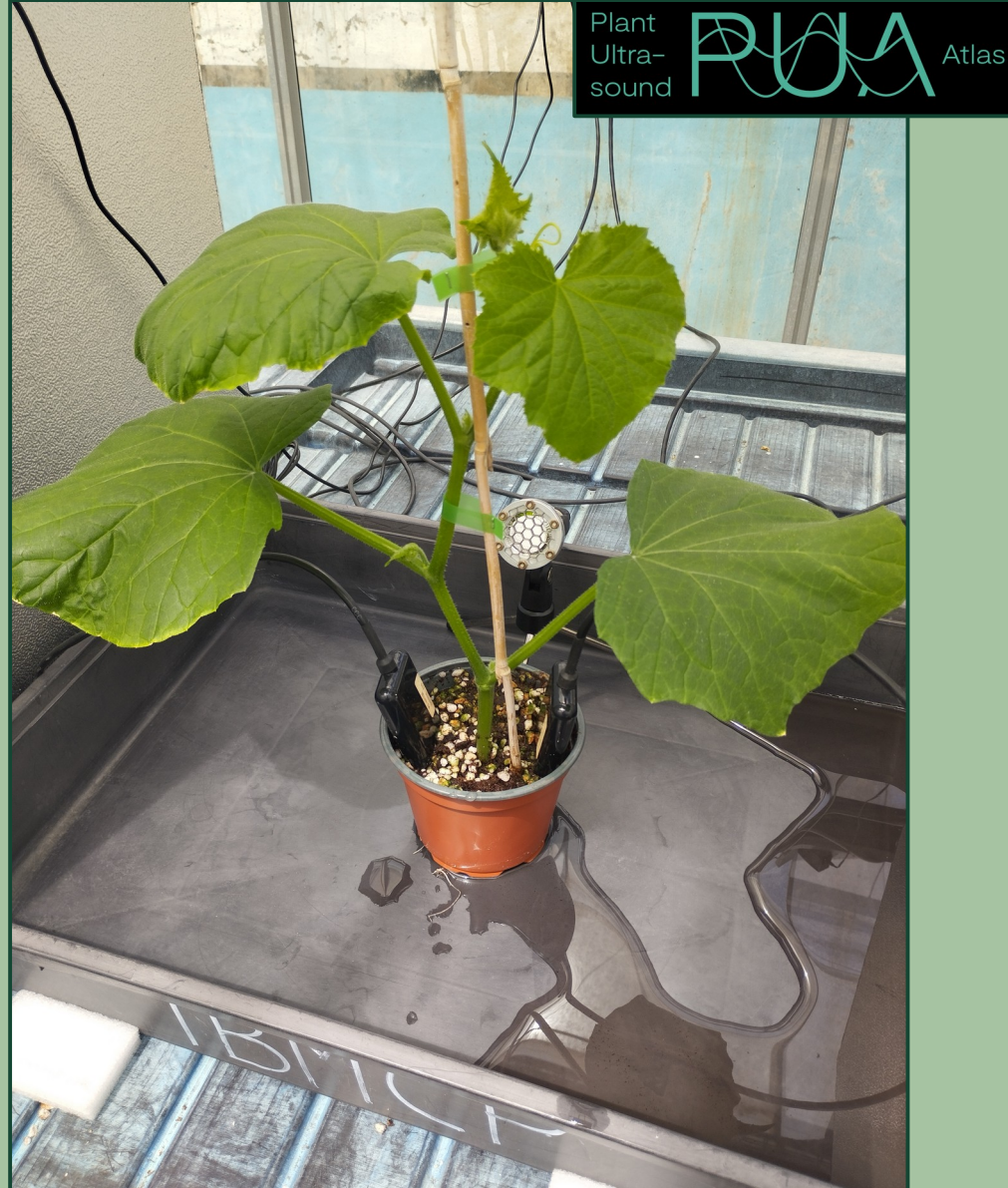


Machine Learning Process



Set de grabación





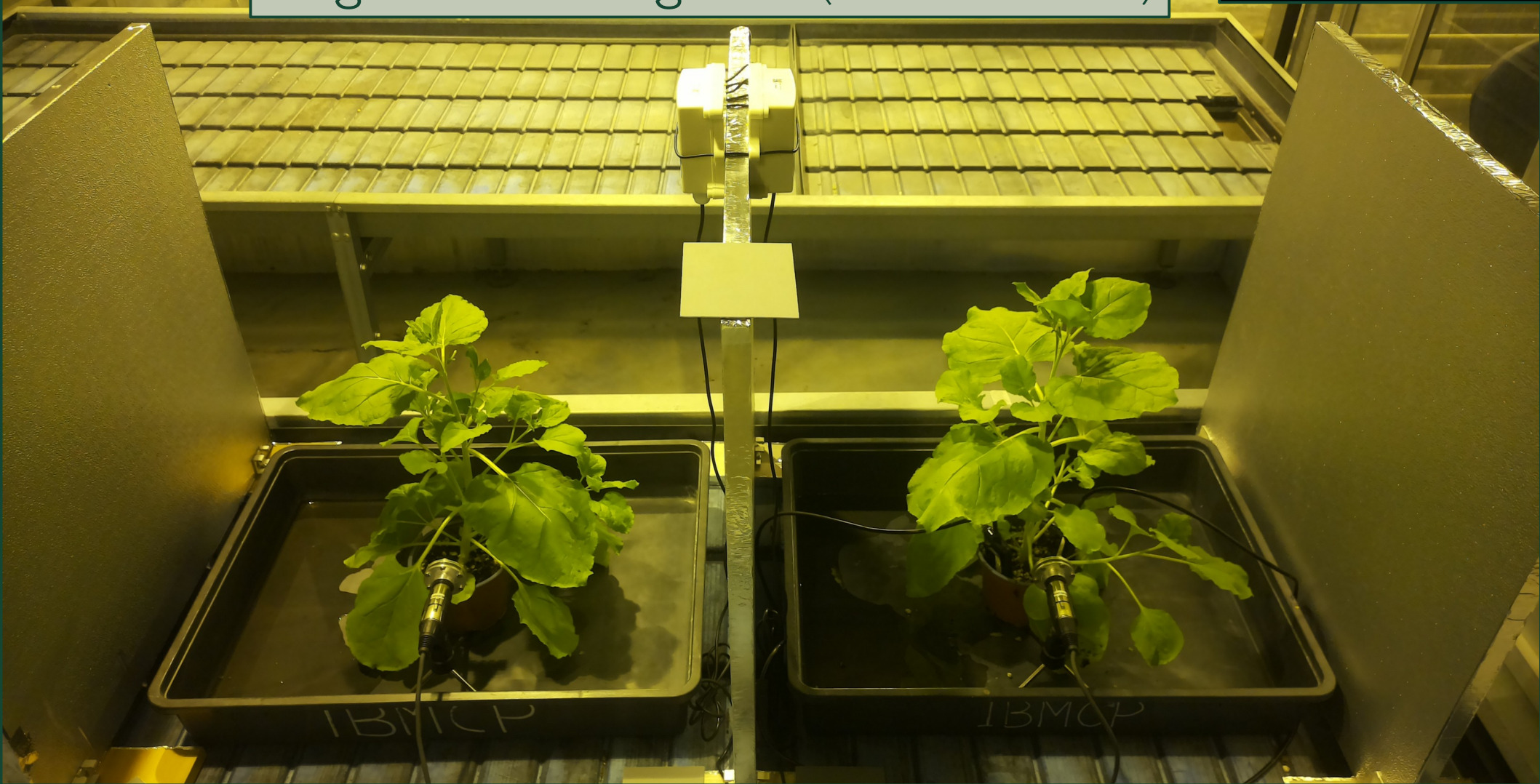
Set de grabación



Registro de imágenes (cada 10 minutos)



Registro de imágenes (cada 10 minutos)



Registro de imágenes (cada 10 minutos)



Análisis de las sesiones de grabación

A/D converter



1



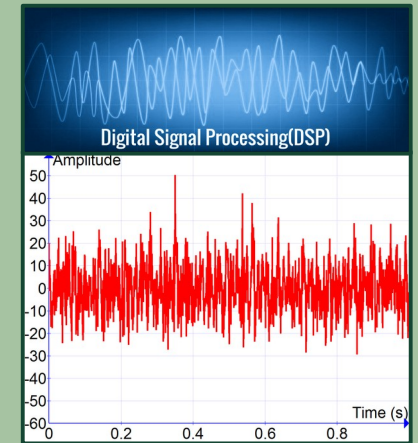
2



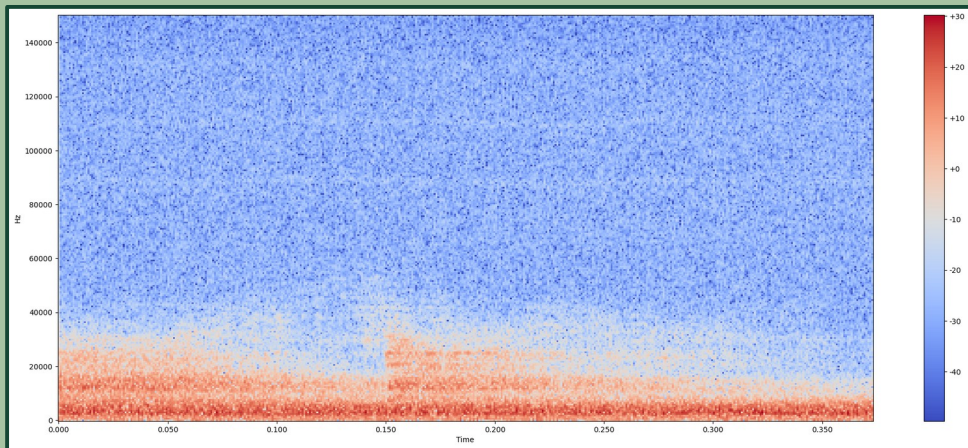
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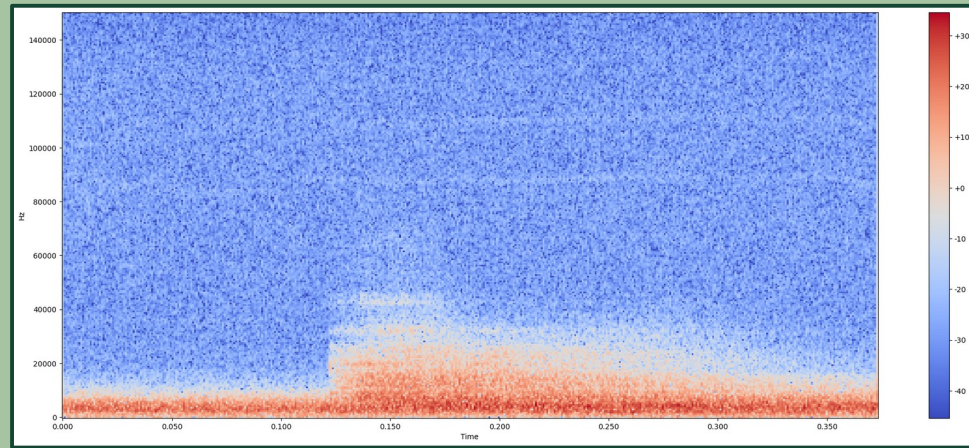
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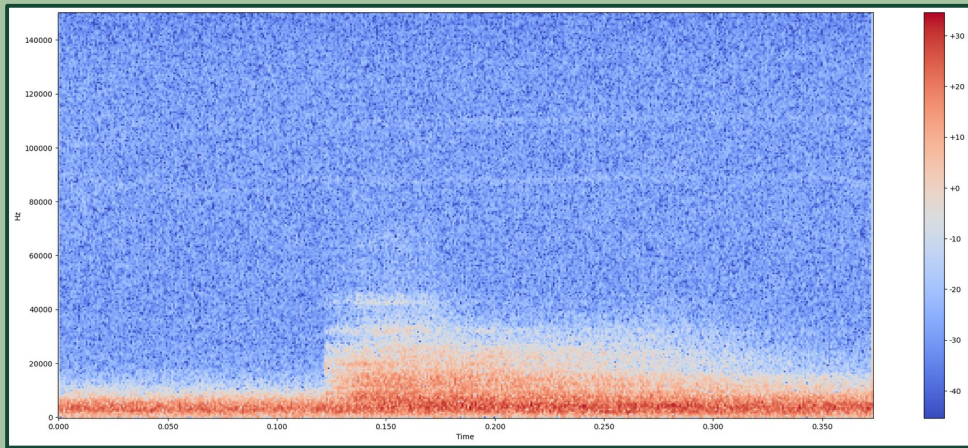
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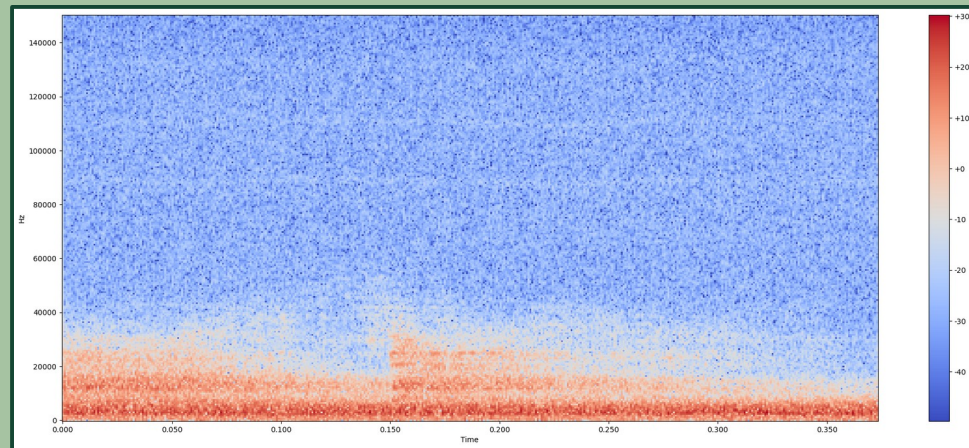
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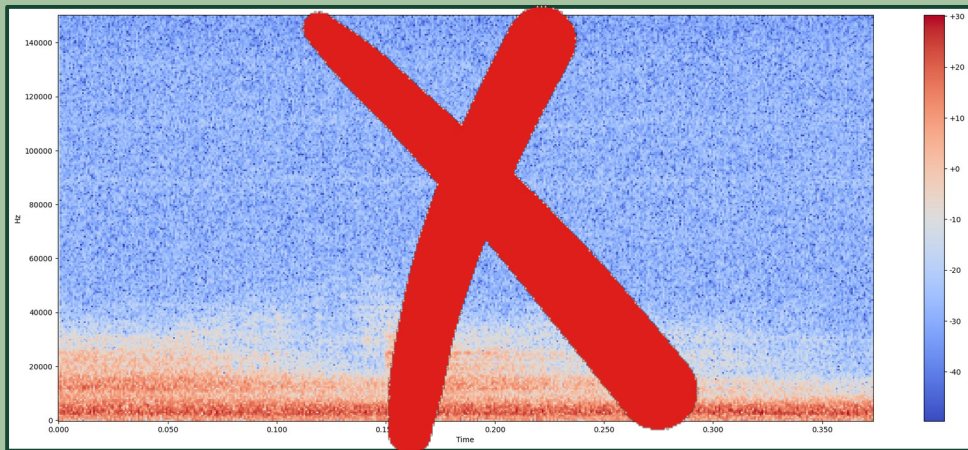
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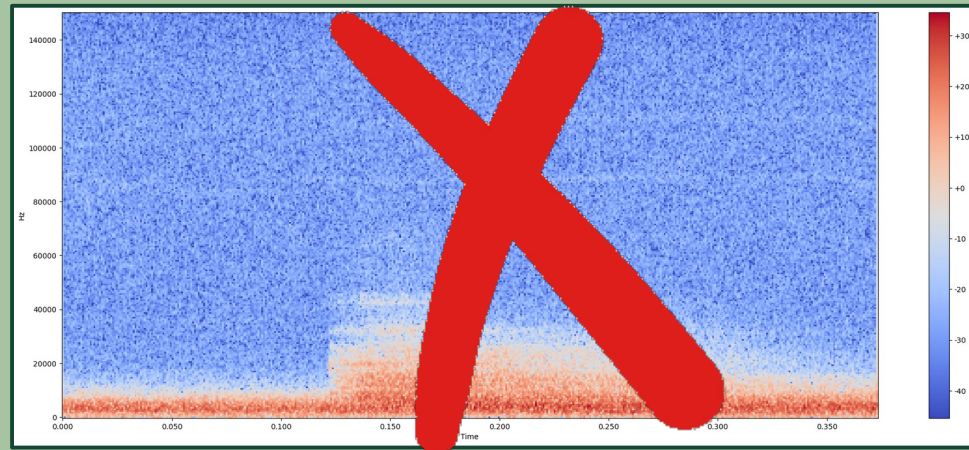
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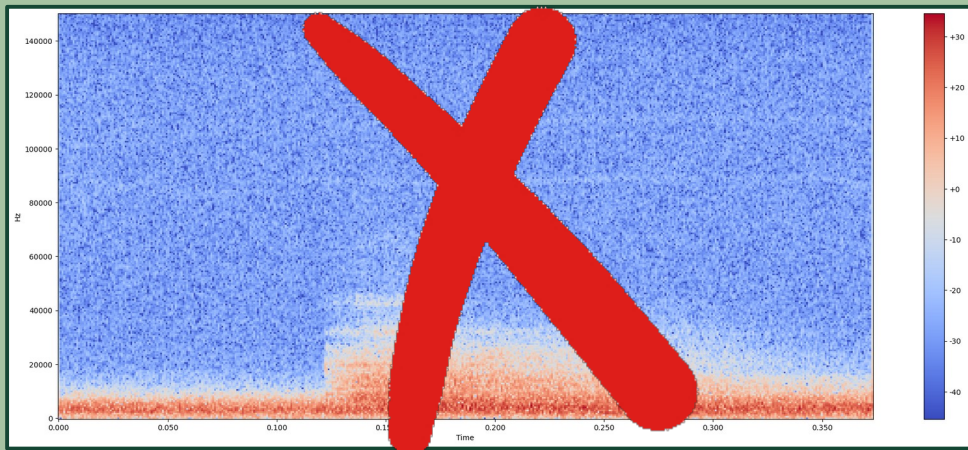
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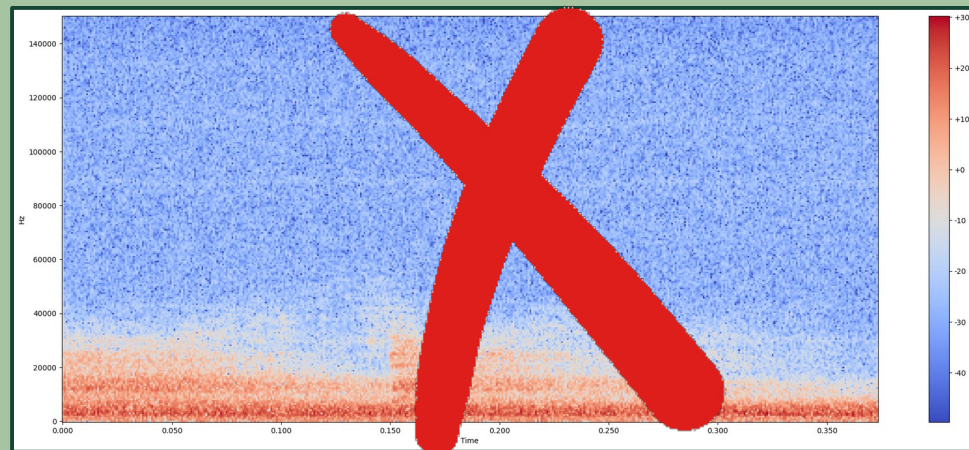
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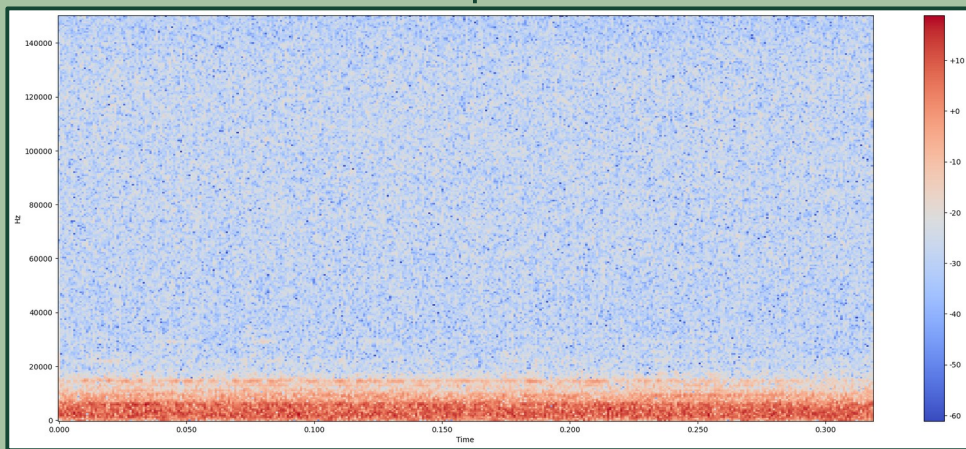
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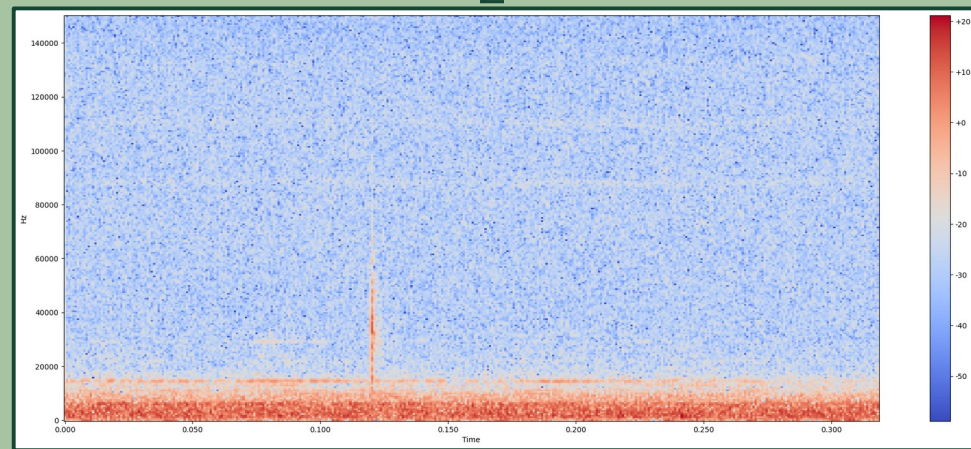
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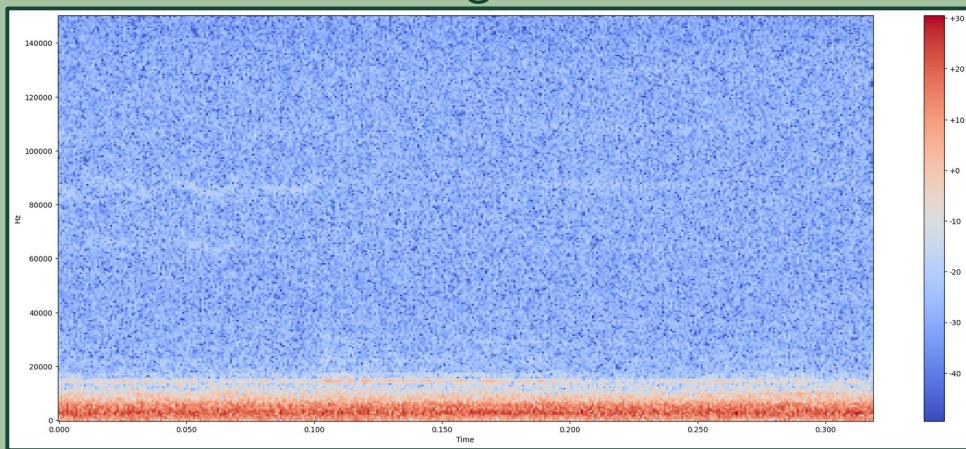
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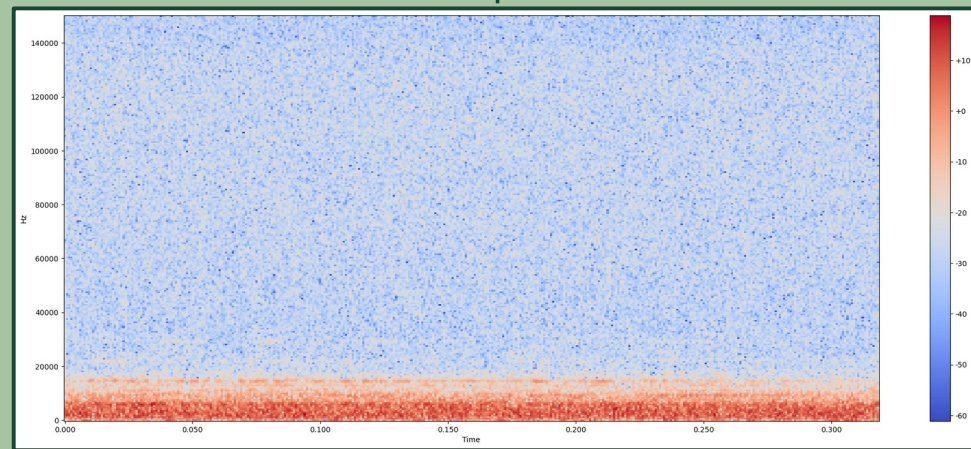
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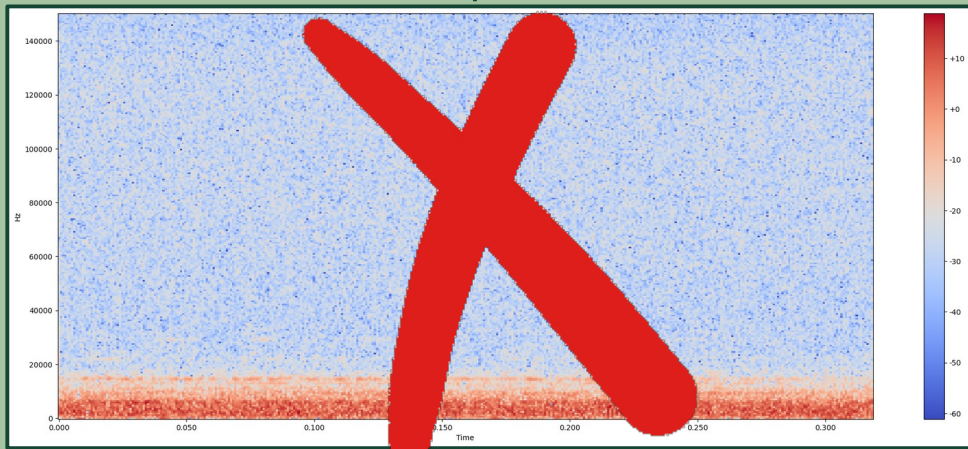
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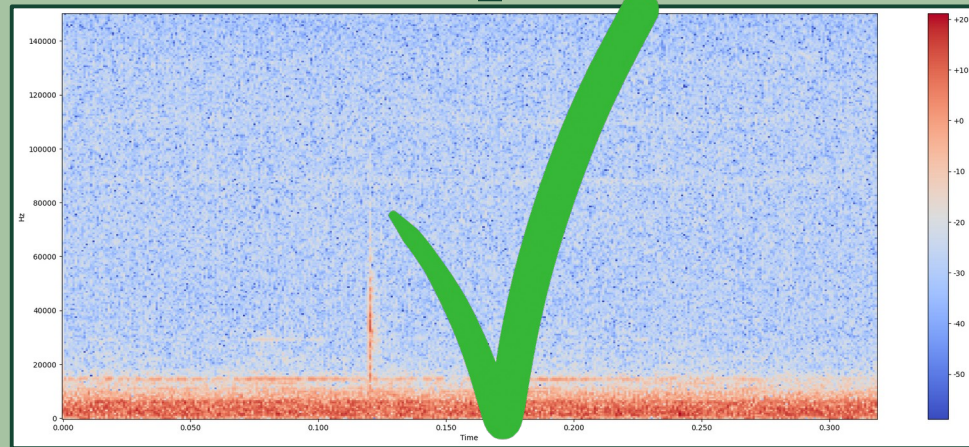
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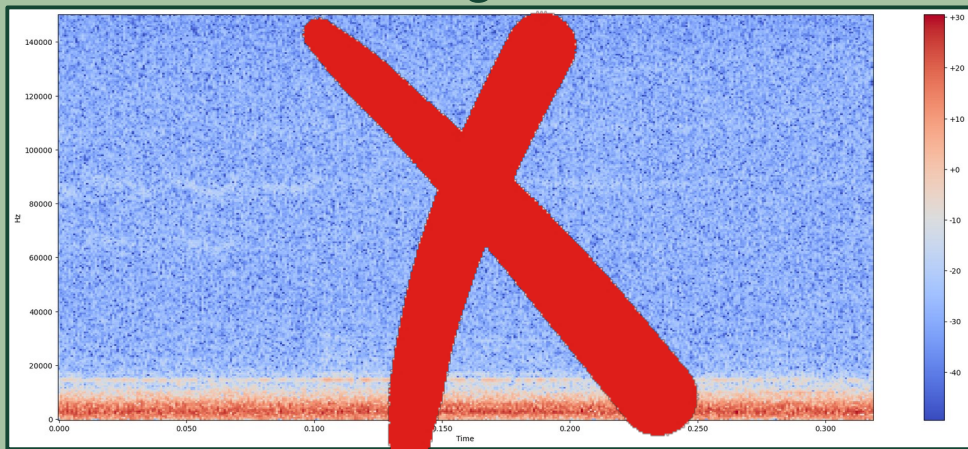
1



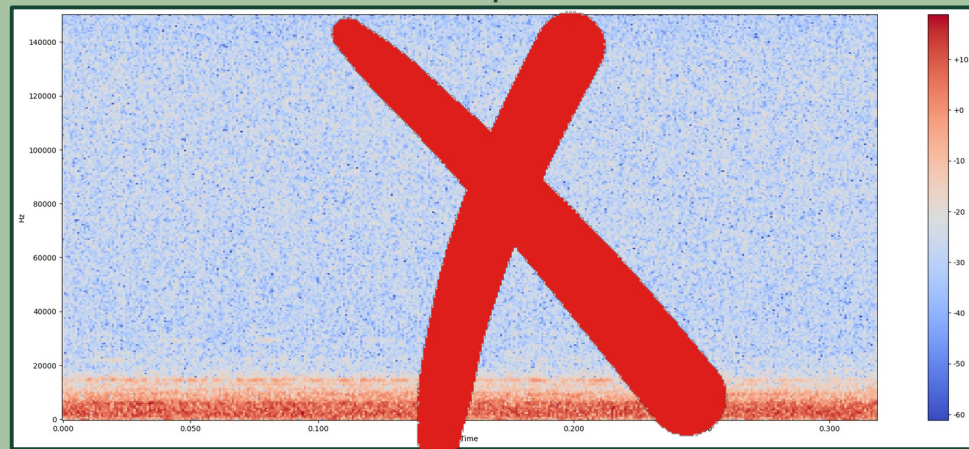
2



3



4



51 sesiones de grabación 5-10 días/sesión

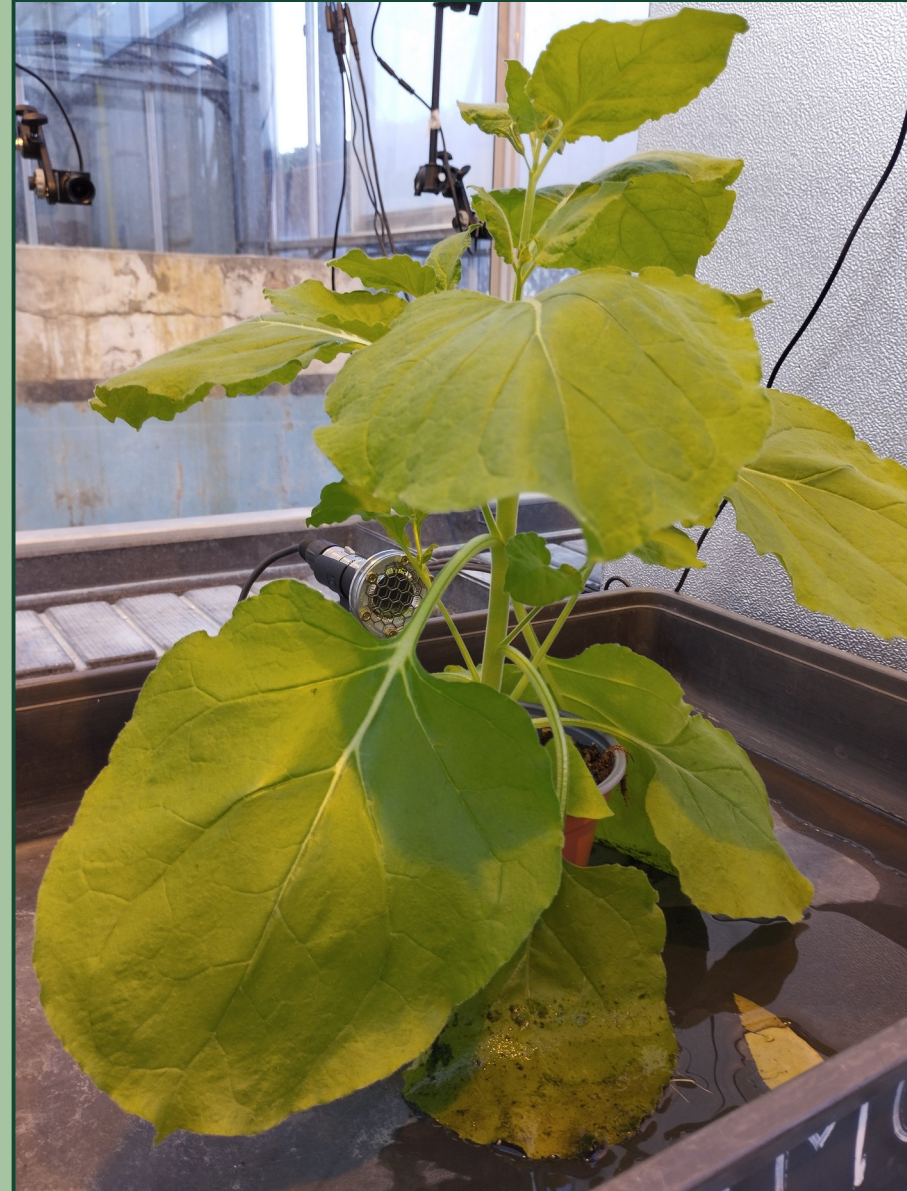


25,000+ horas de grabaciones



121 plantas grabadas
12 especies distintas

Tabaco salvaje
Nicotiana benthamiana



121 plantas grabadas
12 especies distintas

Tomate
Solanum lycopersicum



121 plantas grabadas
12 especies distintas

Pimiento
Capsicum annuum



121 plantas grabadas
12 especies distintas

Pepino
Cucumis sativus



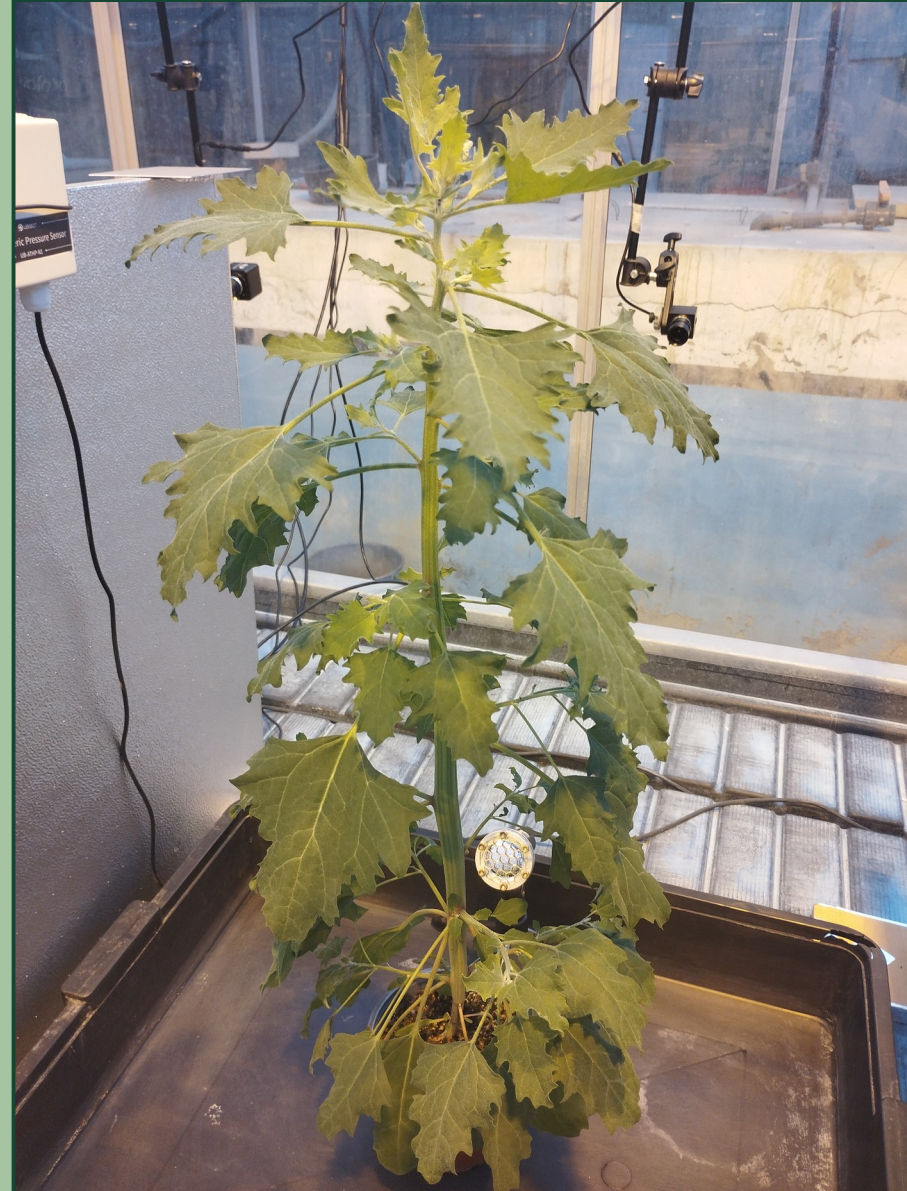
121 plantas grabadas
12 especies distintas

Amaranto
Amaranthus hypochondriacus



121 plantas grabadas
12 especies distintas

Quinoa
Chenopodium quinoa



121 plantas grabadas
12 especies distintas

Crisantemo
Chrysanthemum morifolium



121 plantas grabadas
12 especies distintas

Guisante
Pisum sativum



121 plantas grabadas
12 especies distintas

Garbanzo
Cicer arietinum



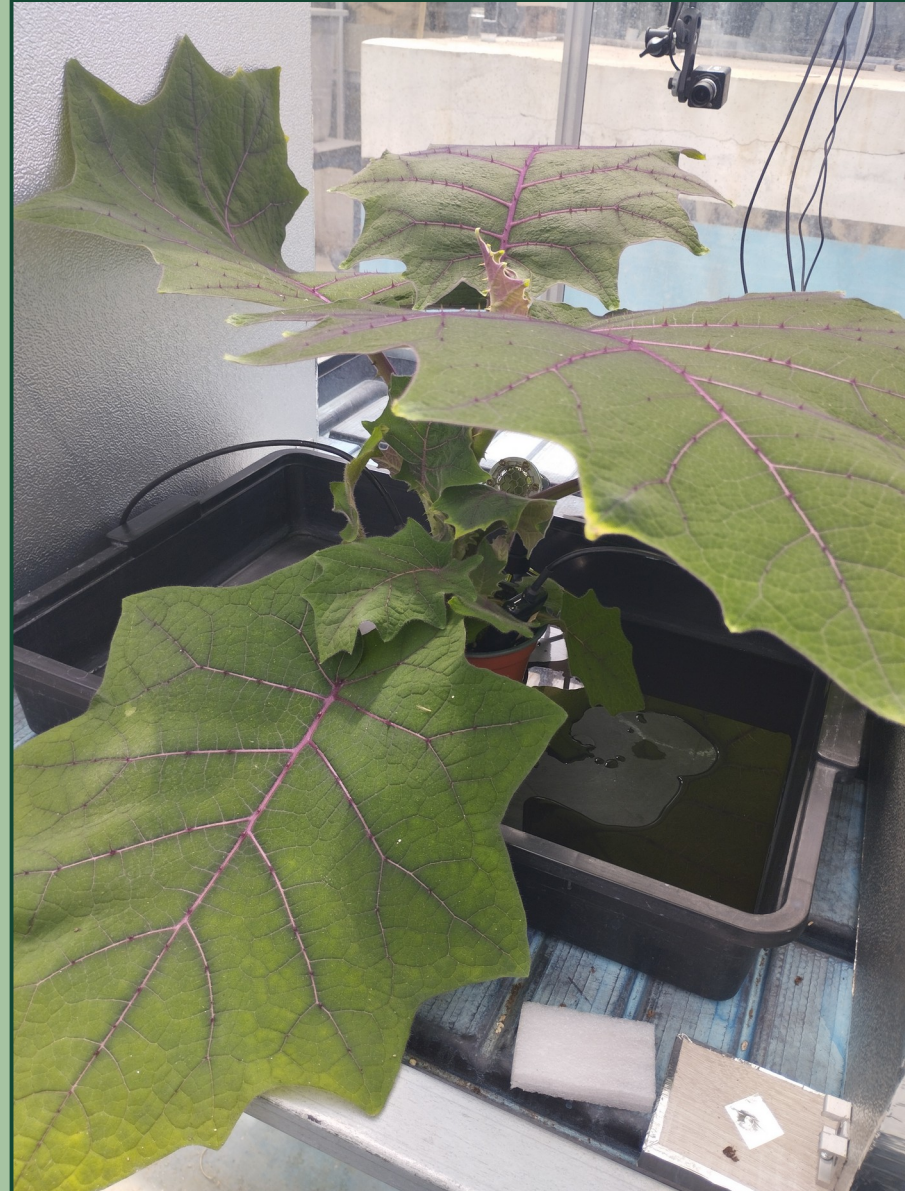
121 plantas grabadas
12 especies distintas

Soja
Glycine max



121 plantas grabadas
12 especies distintas

Lulo/naranjillo
Solanum quitoense



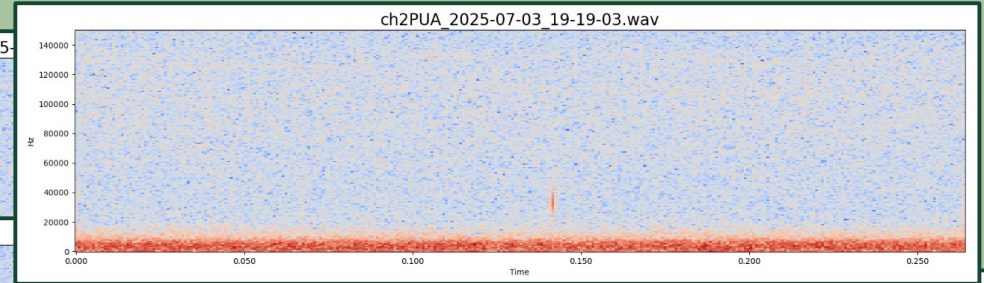
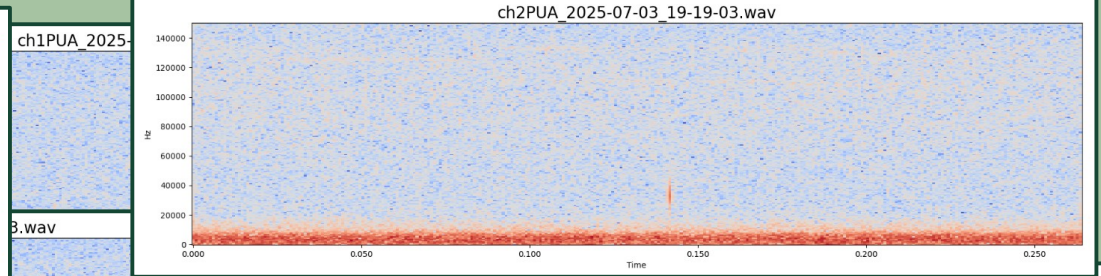
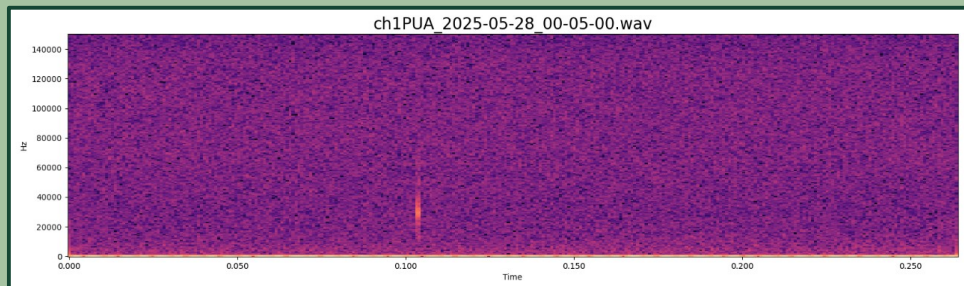
121 plantas grabadas
12 especies distintas

Cítrico (portainjerto)
Citrus macrophylla



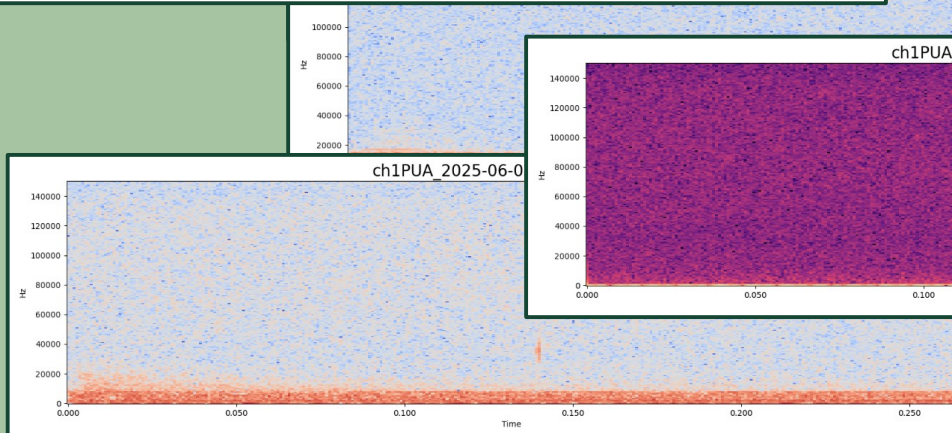
Atlas sonoro obtenido

15,000+ emisiones de ultrasonidos de plantas detectados
390,000+ diferentes registros ultrasónicos obtenidos

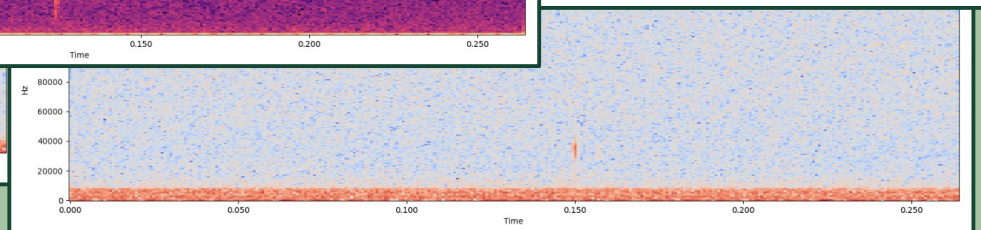
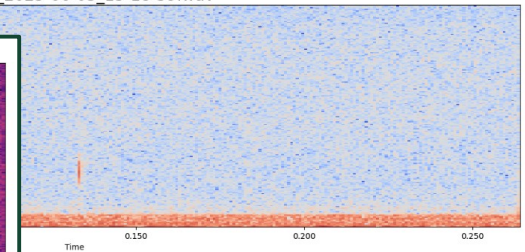


3.wav

ch1PUA_2025-06-03_02-54-20.wav

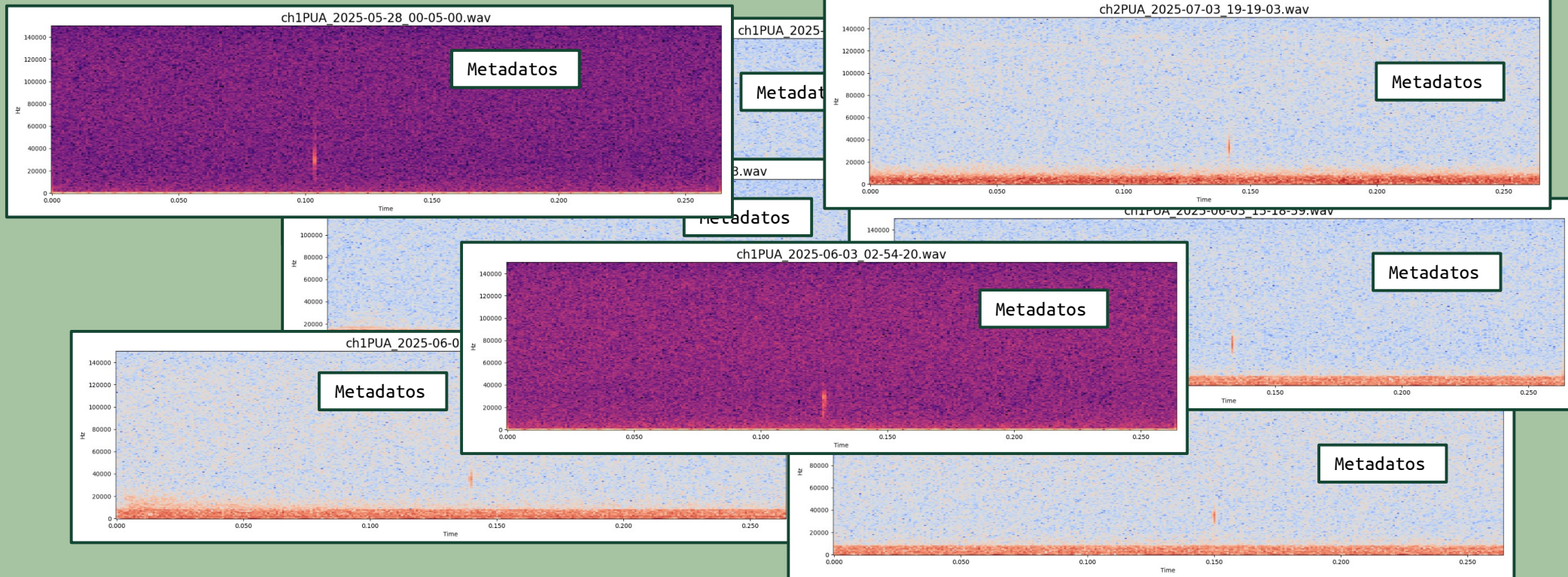


ch1PUA_2025-06-03_15-18-59.wav



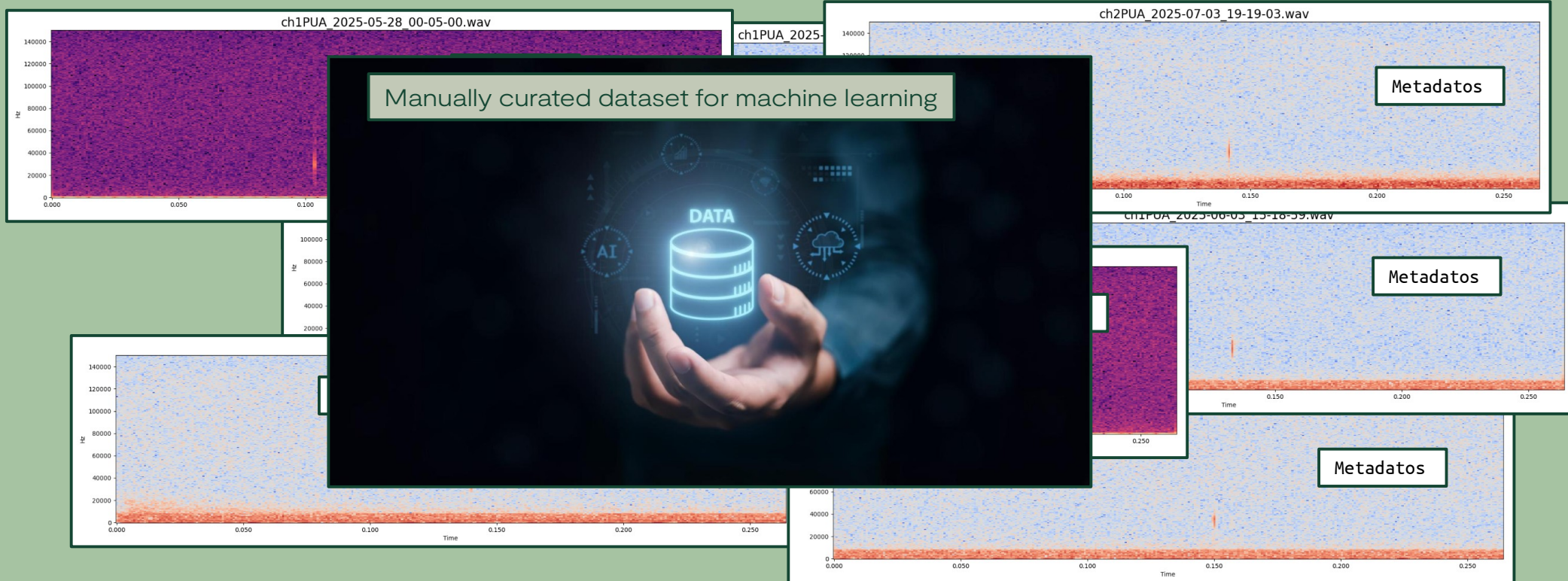
Atlas sonoro obtenido

15,000+ emisiones de ultrasonidos de plantas detectados
390,000+ diferentes registros ultrasónicos obtenidos



Atlas sonoro obtenido

15,000+ emisiones de ultrasonidos de plantas detectados
390,000+ diferentes registros ultrasónicos obtenidos



<https://pua.webs.upv.es>

Escuchar a las Plantas: Atlas Sonoro para (Re)Conocer Otras Inteligencias

¿Existen otras inteligencias distintas a la humana? ¿Podemos escuchar y entender a las plantas?

Atlas sonoro



Atlas

PUAdb

Search across all columns...

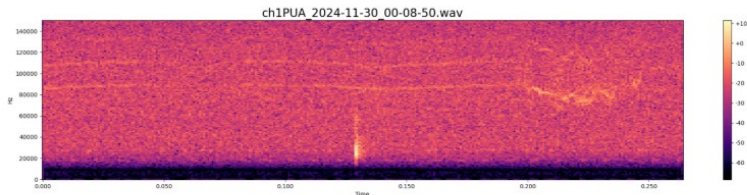
Total Rows: 15,227 | Filtered: 15,227

Active Filters: 0

Export CSV

Show more columns

▶	Us Public Name	Datetime	Contributor	Location	Plant Scientific Name	Specimen
▶	PUA1	2024-11-30 00:08:50	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA2	2024-11-30 03:59:21	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA3	2024-11-30 06:21:46	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA4	2024-11-30 08:16:19	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA5	2024-12-01 07:14:58	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA6	2024-12-01 07:33:29	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA7	2024-12-01 10:04:01	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA8	2024-12-01 10:59:40	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA9	2024-12-01 11:20:52	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA10	2024-12-01 11:24:18	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA11	2024-12-01 11:28:23	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA12	2024-12-01 11:56:25	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49
▶	PUA13	2024-12-01 13:10:41	PUA	IBMCP greenhouse	Nicotiana benthamiana	#49



▶ 0:00 / 0:00



⬇ Descargar wav

⬇ Descargar wav audible (WAV)

Metadata

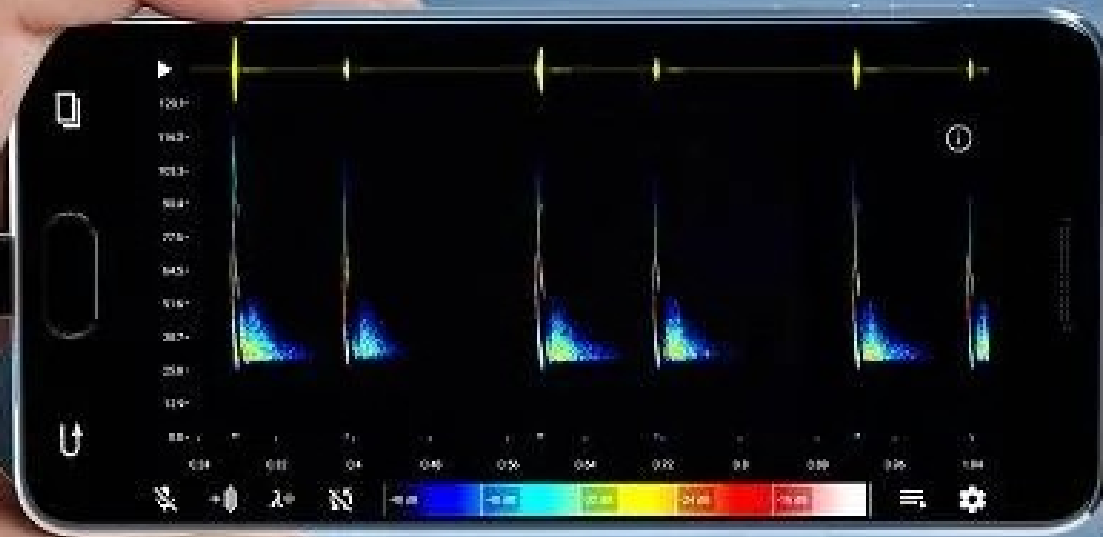
Us Public Name	PUA1
Us Base Name	ch1PUA_2024-11-30_00-08-50
Recording Session	PUA060
Recording Session Start	November 29, 2024 3:40 PM
Recording Session End	December 3, 2024 8:09 AM
Microphone	ch1
Datetime	November 30, 2024 12:08 AM
Contributor	PUA
Location	IBMCP greenhouse
Plant Scientific Name	Nicotiana benthamiana
Plant Popular Names	wild tobacco/tabaco silvestre
Specimen	#49
Specimen Age Days	33
Hours After Watering	8
Ultrasound Identification	manual
Temperature	23.6702
Humidity	55.9365
Co2	414
Light	0.15
Atmospheric Pressure	102.5
Soil Sensors	ph1,temphum1
Soil Temperature	21.1
Soil Temperature Determination	single-measured
Soil Humidity	62.7
Soil Humidity Determination	single-measured
Soil Ph	5.4

PUAdb

Ciencia
CIUDADANA



Be a citizen
scientist



Vídeos *timelapse*



2024/11/30 07:50:01

IBMCP

Wild tobacco

Nicotiana benthamiana
plant #49 (~32 days old)

16
hours since watering

24.1 °C
temperature

54.4 %
humidity

436.1 ppm
CO₂

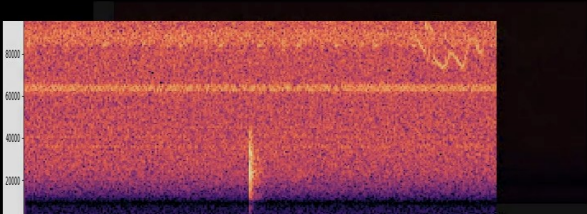
2294.7 lux
light

102.6 KPa
atmospheric pressure

20.6 °C
soil temperature

46.8 %
soil moisture

5.3
soil pH



00:20 -03:34

100% -03:34/03:54

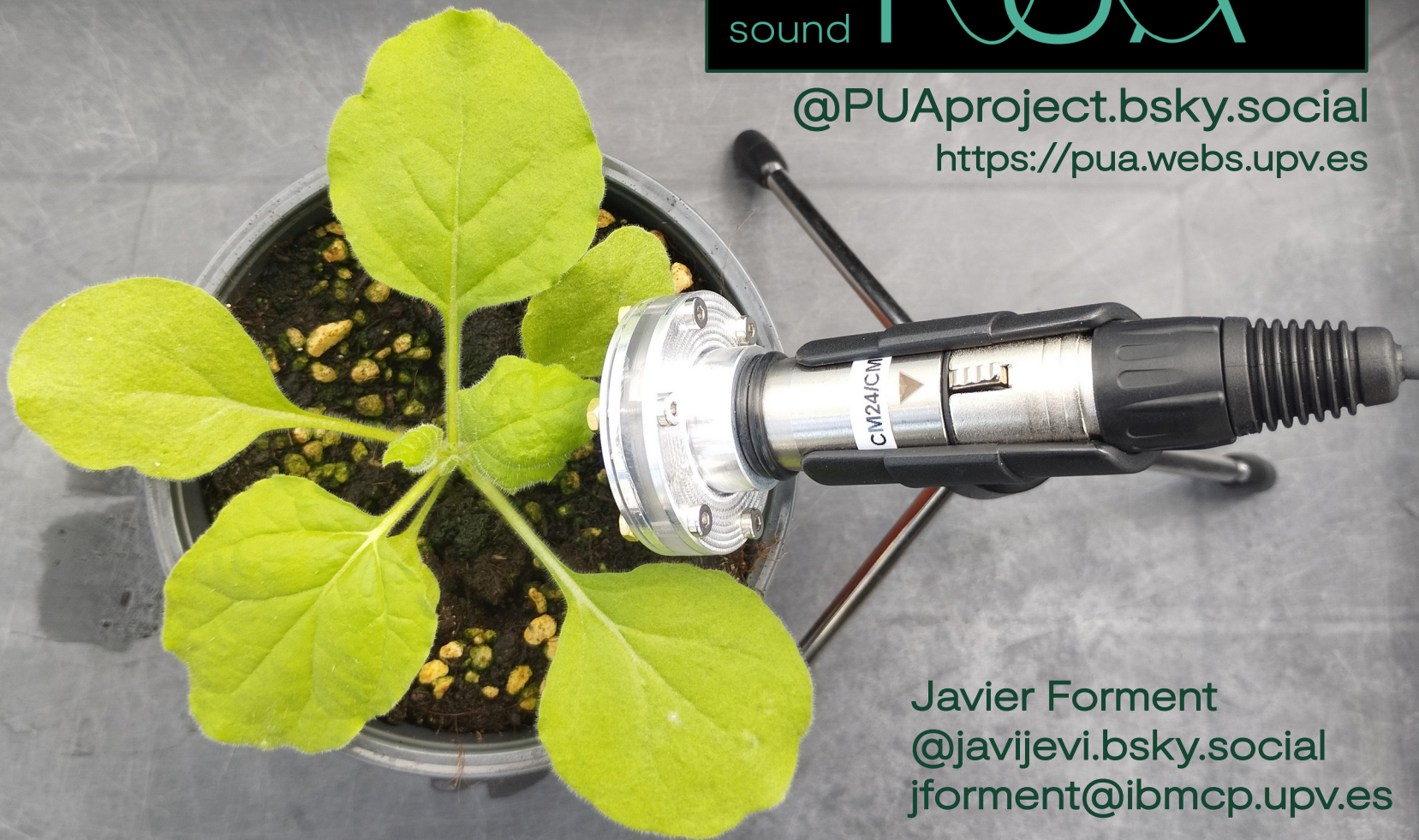


Plant
Ultra-
sound

PUA Atlas

@PUAproject.bsky.social

<https://pua.webs.upv.es>



Javier Forment

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jforment@ibmcp.upv.es

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estampa

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