White lupin variety list describing the low alkaloid genetics for dissemination to seed producers (English)

Name	Spring (s) or Winter (w) type	proven *pauper**	proven non-pauper	Reference	registra-tion country	latest registration date (CPVO)
Amiga	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Schwertfirm et al. (2024) Patyi et al. (2025)	FR	1985
Boros	s	*probably pauper*		Rychel and Książkiewicz (2019) Schwertfirm et al. (2024) Patyi et al. (2025) - contradictory result	PL	2003
Butan	s		*non-pauper*	Rychel and Książkiewicz (2019) Schwertfirm et al. (2024) Patyi et al. (2025)	PL	2006
Celina	s	*pauper**		Schwertfirm et al. (2024)	DE	2019
Dieta	s		*non-pauper*	Schwertfirm et al. (2024) Hufnagel et al. (2021) Patyi et al. (2025)	UK	N. A.
Energy	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Schwertfirm et al. (2024)		2011
Feodora	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Schwertfirm et al. (2024) Patyi et al. (2025)	DE	2004
Figaro	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Patyi et al (2025)	FR	2017
Frieda	s	*pauper**		Schwertfirm et al. (2024) Patyi et al (2025)	DE	2019
Kulig	s	*na*	*na*		PL	2024
Magnus	w	*probably pauper*		Hufnagel et al. (2021) Schwertfirm et al. (2024) Patyi et al (2025) - contradictory result	FR	2022
Nelly	s		*non-pauper*	Rychel and Książkiewicz (2019)	HU	(until 2027)

Orus	w	*probably pauper*		Hufnagel et al. (2021) Schwertfirm et al. (2024) Patyi et al (2025) - contradictory result	FR	2017
SM Belter	s	*na*	*na*		PL	2025
Sulimo	s	*pauper**		Mancinotti et al. (2023) Schwertfirm et al. (2024)	FR	2019
Tennis	s	*na*	*na*		IT	2020
Victor Baer	s	*pauper**		Schwertfirm et al. (2025)		2019
Zulika	s		*probably non-pauper*	Unpublished data from FiBL	CZ	2009

***direct proof of the causal mutation (Lalb_Chr18_12359687 (*pauper*)**

Table without guarantee.

Compiled by FiBL, DSV and LfL.

References

Caption in table	DOA	Full Reference
Rychel and Książkiewicz 2019	https://link.springer.com/article/10.1007/s13353-019-00508-9	Rychel, S., Książkiewicz, M. Development of gene-based molecular markers tagging low alkaloid *pauper* locus in white lupin (*Lupinus albus* L.). *J Appl Genetics* **60**, 269–281 (2019).
Hufnagel et al. (2021) white lupin pangenome	https://onlinelibrary.wiley.com/doi/10.1111/pbi.13678 https://www.whitelupin.fr/	Hufnagel, B., Soriano, A., Taylor, J., Divol, F., Kroc, M., Sanders, H., Yeheyis, L., Nelson, M., & Peret, B. (2021). Pangenome of white lupin provides insights into the diversity of the species. Plant Biotechnol J, 19(12), 2532–2543. https://doi.org/10.1111/pbi.13678
Mancinotti et al. (2023)	https://www.science.org/doi/pdf/10.1126/sciadv.adg8866	Mancinotti, D., Czepiel, K., Taylor, J. L., Golshadi Galehshahi, H., Møller, L. A., Jensen, M. K., Motawia, M. S., Hufnagel, B., Soriano, A., Yeheyis, L., Kjaerulff, L., Péret, B., Staerk, D., Wendt, T., Nelson, M. N., Kroc, M., & Geu-Flores, F. (2023). The causal mutation leading to sweetness in modern white lupin cultivars. Science Advances, 9(31), eadg8866. https://doi.org/10.1126/sciadv.adg8866
Schwertfirm et al. (2024)	https://doi.org/10.1007/s00122-024-04665-2	Schwertfirm, G., Schneider, M., Haase, F. et al. Genome-wide association study revealed significant SNPs for anthracnose resistance, seed alkaloids and protein content in white lupin. Theor Appl Genet 137, 155 (2024).
Patyi et al. (2025)	https://doi.org/10.1186/s12870-025-06951-7	Patyi, A., Kamp, M., Arncken, C. et al. Identification of a new QTL associated to reduced quinolizidine alkaloid content in white lupin (Lupinus albus, L.) and development of ultra-low alkaloid recombinants by stacking with the pauper allele. BMC Plant Biol 25, 945 (2025).

Sortenliste Weisse Lupine mit Beschreibung der Alkaloidarmuts-Genetik zur Bekanntmachung bei Saatgutproduzenten (Deutsch)

Name	Sommer- (s) oder Winter- form (w)	*pauper* erwiesen*	nicht- pauper erwiesen	Literaturangabe	Anmel- dung in (Land)	Letztes Registrie- rungs- datum (CPVO)
Amiga	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Schwertfirm et al. (2024) Patyi et al. (2025)	FR	1985
Boros	s	*vermutlich pauper*		Rychel and Książkiewicz (2019) Schwertfirm et al. (2024) Patyi et al. (2025) - gegenteiliges Ergebnis	PL	2003
Butan	s		*nicht-pauper*	Rychel and Książkiewicz (2019) Schwertfirm et al. (2024) Patyi et al. (2025)	PL	2006
Celina	s	*pauper**		Schwertfirm et al. (2024)	DE	2019
Dieta	s		*nicht-pauper*	Schwertfirm et al. (2024) Hufnagel et al. (2021) Patyi et al. (2025)	UK	N. A.
Energy	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Schwertfirm et al. (2024)		2011
Feodora	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Schwertfirm et al. (2024) Patyi et al. (2025)	DE	2004
Figaro	s	*pauper**		Hufnagel et al. (2021) Mancinotti et al. (2023) Patyi et al (2025)	FR	2017
Frieda	s	*pauper**		Schwertfirm et al. (2024) Patyi et al (2025)	DE	2019
Kulig	s	*k.A.*	*k.A.*		PL	2024
Magnus	w	*vermutlich pauper*		Hufnagel et al. (2021) Schwertfirm et al. (2024) Patyi et al (2025) - gegenteiliges Ergebnis	FR	2022
Nelly	s		*nicht-pauper*	Rychel and Książkiewicz (2019)	HU	(bis 2027)

Orus	w	*vermutlich pauper*		Hufnagel et al. (2021) Schwertfirm et al. (2024) Patyi et al (2025) - gegenteiliges Ergebnis	FR	2017
SM Belter	s	*k.A.*	*k.A.*		PL	2025
Sulimo	s	*pauper**		Mancinotti et al. (2023) Schwertfirm et al. (2024)	FR	2019
Tennis	s	*k.A.*	*k.A.*		IT	2020
Victor Baer	s	*pauper**		Schwertfirm et al. (2025)		2019
Zulika	s		*vermutlich nicht-pauper*	Unveröffentlichte Daten, FiBL	CZ	2009

*** direkter Nachweis der ursächlichen Mutation (Lalb_Chr18_12359687 (*pauper*)**

Tabelle ohne Gewähr. Zusammengestellt von FiBL, DSV und LfL.

Wissenschaftliche Literatur

Nennung in der Tabelle	DOA	Vollständige Literaturangabe
Rychel and Książkiewicz 2019	https://link.springer.com/article/10.1007/s13353-019-00508-9	Rychel, S., Książkiewicz, M. Development of gene-based molecular markers tagging low alkaloid *pauper* locus in white lupin (*Lupinus albus* L.). *J Appl Genetics* **60**, 269–281 (2019).
Hufnagel et al. (2021) white lupin pangenome	https://onlinelibrary.wiley.com/doi/10.1111/pbi.13678 https://www.whitelupin.fr/	Hufnagel, B., Soriano, A., Taylor, J., Divol, F., Kroc, M., Sanders, H., Yeheyis, L., Nelson, M., & Peret, B. (2021). Pangenome of white lupin provides insights into the diversity of the species. Plant Biotechnol J, 19(12), 2532–2543. https://doi.org/10.1111/pbi.13678
Mancinotti et al. (2023)	https://www.science.org/doi/pdf/10.1126/sciadv.adg8866	Mancinotti, D., Czepiel, K., Taylor, J. L., Golshadi Galehshahi, H., Møller, L. A., Jensen, M. K., Motawia, M. S., Hufnagel, B., Soriano, A., Yeheyis, L., Kjaerulff, L., Péret, B., Staerk, D., Wendt, T., Nelson, M. N., Kroc, M., & Geu-Flores, F. (2023). The causal mutation leading to sweetness in modern white lupin cultivars. Science Advances, 9(31), eadg8866. https://doi.org/10.1126/sciadv.adg8866
Schwertfirm et al. (2024)	https://doi.org/10.1007/s00122-024-04665-2	Schwertfirm, G., Schneider, M., Haase, F. et al. Genome-wide association study revealed significant SNPs for anthracnose resistance, seed alkaloids and protein content in white lupin. Theor Appl Genet 137, 155 (2024).
Patyi et al. (2025)	https://doi.org/10.1186/s12870-025-06951-7	Patyi, A., Kamp, M., Arncken, C. et al. Identification of a new QTL associated to reduced quinolizidine alkaloid content in white lupin (Lupinus albus, L.) and development of ultra-low alkaloid recombinants by stacking with the pauper allele. BMC Plant Biol 25, 945 (2025).