Article

Grain yield stabilizing effect of cereal-legume intercrops is more pronounced in more productive conditions

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Supplementary Table S1. Overview of the crop cultivars and cultivar combinations (i.e., plant teams) grown as sole crops and intercrops across Europe in both 2017 and 2018 and used in the analyses. The experimental conditions (e.g., fertilizer treatments) under which the various teams were grown in the different locations are summarized in Table 1. Variety acronyms: Ald 'KWS Alderon', Ale 'Alexia', Art 'Artur Nick', Aud 'Audit', Aur 'Aureo'[¥], Box 'Boxer', Chia 'Chiaro de Torre Lama', Cla 'Clara', Cor 'Cornetto', Day 'Daytona', Disk 'Diskett', Fue 'Fuego', Har 'Hardy', Ing 'Ingrid', Jul 'Julia', Lau 'Laureate', Myt 'Mythic', Odi 'Odisseo'[¥], Pew 'Pewter', Pla 'RGT Planet', Prot 'Prothabat 69', Sal 'Salome', Sass 'KWS Sassy', Shak 'Shakira', Sun 'Sunshine', Tam 'Tamtam', Tea 'Tea', Tyb 'Tybalt', Vil 'Vilgott'; n/a not applicable; the plant teams in **bold** were grown in more than one location

Location	Barley & pea	Wheat & faba bean
Spain (Córdoba)	Pew-Aud, Shak-Aud	Art-Prot
Italy (Ancona)	Tea-Har	Aur[¥]-Chia, Aur[¥]-Prot, Odi[¥]-Chia, Odi[¥]-Prot
Austria (Gleisdorf)	n/a	Cor-Ale, **Cor-Jul**
Germany (Münster)	Sal-Har, Sun-Har	**Cor-Fue**, Tyb-Fue, Tyb-Jul
Denmark (Taastrup)	**Tam-Ing**, Sal-Aud, Sal-Ing, Sal-Myt, Tam-Aud, Tam-Myt	**Cor-Box**, **Cor-Jul**, **Ald-Box**, Ald-Jul
United Kingdom (Dundee)	**Pla-Ing**, **Pla-Cla**, **Tam-Ing**, **Tam-Cla**, Lau-Cla, Lau-Day, Lau-Ing, Lau-Sak, Sass-Cla, Sass-Day, Sass-Ing, Sass-Sak, Plan-Day, Tam-Day, Plan-Sak, Tam-Sak	n/a
Sweden (Uppsala)	**Pla-Ing**, **Pla-Cla**, **Tam-Ing**, **Tam-Cla**, Vil-Cla, Vil-Ing	**Cor-Box**, **Cor-Fue**, **Ald-Box**, Ald-Fue, Disk-Box, Disk-Fue

[¥] Durum wheat (*Triticum durum*)

Supplementary Table S2. Calculation of crop stand-based adjusted coefficients of variance (aCV) for expected (from sole crops) and observed (intercrops) mean grain yield values computed across all field trial locations, fertilizer levels and years (i.e., "ALL" in Table 2). The original data was insufficient to generate robust values of *b*, and we therefore used the TPL regression statistics for legume and cereal yields by [1] (intercept -0.831, slope 1.240, df = 469, R^2 = 0.36, P<0.001; see Fig. 2c in the original publication), according to a procedure suggested by [2].

	Barley & pea		Wheat & faba bean	
	Expected (n = 96)	Observed (n = 96)	Expected (n = 66)	Observed (n = 66)
Mean	3.3	3.8	3.7	4.0
Variance	3.2	3.9	2.3	2.3
Log(mean)	0.51	0.58	0.57	0.60
Log(variance)	0.50	0.59	0.36	0.36
POLAR	0.69	0.70	0.48	0.44
Adj. logvar.	0.46	0.59	0.36	0.39
aCV	52.1	52.5	40.7	38.9

Supplementary Table S3. Single crop-based year-to-year mean grain yield differences for various pea varieties grown as sole crops and as pea-barley intercrops (plant teams) across Europe in both 2017 and 2018. N indicates the number of plant team comparisons; e.g., n = 4 could imply either that a given plant team was grown in four locations as sole crop and intercrop, or that the team was grown in two locations at two fertilizer treatments as sole crop and intercrop. Further information on the plant teams and growing conditions in the various locations is found in Tables 1, 2 and S1.

Plant team (Pea in *italics*)	Yield difference (Mg ha^{-1})	Std. Deviation	*n*
Audit & Pewter	2.22	1.69	4
Audit & Salome	2.54	0.78	2
Audit & Shakira	2.22	1.69	4
Audit & Tamtam	2.57	0.74	2
Clara & Planet	0.58	0.53	6
Clara & Tamtam	0.57	0.53	6
Clara & Laureate	1.20	0.55	2
Clara & KWS Sassy	1.35	0.33	2
Clara & Vilgott	0.35	0.21	4
Daytona & Laureate	1.58	0.94	2
Daytona & Planet	1.75	0.70	2
Daytona & KWS Sassy	1.85	0.56	2
Daytona & Tamtam	1.98	0.37	2
Hardy & Salome	0.72	0.70	4
Hardy & Sunshine	0.73	0.71	4
Hardy & Tea	0.66	0.34	4
Ingrid & Planet	1.02	0.42	6
Ingrid & Tamtam	2.20	1.82	10
Ingrid & Laureate	1.03	0.66	2
Ingrid & Salome	3.79	1.40	4
Ingrid & KWS Sassy	0.82	0.96	2
Ingrid & Vilgott	0.90	0.51	4
Mythic & Salome	3.96	1.17	4
Mythic & Tamtam	4.02	1.11	4
Sakura & Laureate	2.16	1.48	2
Sakura & Planet	2.01	1.69	2
Sakura & KWS Sassy	2.50	1.00	2
Sakura & Tamtam	2.41	1.12	2

Supplementary Table S4. Comparison of standardized coefficients of variance (aCV, %) for intercrops (crop stand-based analysis) and their corresponding component sole crops (single crop-based analysis) for barley (B) & pea (P) and wheat (W) and faba bean (F) crops grown in seven locations across Europe. **SP** Spain, **ITA** Italy, **AUT** Austria, **GER** Germany, **DK** Denmark, **UK** United Kingdom, **SWE** Sweden, **ALL** calculations across all sites. The data for the intercrops are taken from Table 2 (i.e., the column "Obs. aCV"), and the data for the sole crops are taken from Figure 3 A, B. n/a not applicable.

Location	B & P			W & F		
	Intercrop	Sole B	Sole P	Intercrop	Sole W	Sole F
SP	99.5	101.9	107.7	93.6	95.1	140.3
ITA	39.7	65.9	20.6	30.4	46.5	17.8
AUT	n/a	n/a	n/a	20.1	4.2	4.6
GER	41.1	47.0	74.3	43.7	45.9	74.6
DK	23.7	23.3	51.6	21.6	25.3	80.1
UK	49.2	62.5	62.2	n/a	n/a	n/a
SWE	35.6	51.9	26.8	20.3	24.1	15.4
ALL	52.5	57.9	81.0	38.9	41.1	71.9

References

1. Reckling, M.; Doering, T.F.; Bergkvist, G.; Stoddard, F.L.; Watson, C.A.; Seddig, S.; Chmielewski, F.-M.; Bachinger, J. Grain legume yields are as stable as other spring crops in long-term experiments across northern Europe. *Agronomy for Sustainable Development* **2018**, *38*, doi:10.1007/s13593-018-0541-3.
2. Reckling, M.; Ahrends, H.; Chen, T.-W.; Eugster, W.; Hadasch, S.; Knapp, S.; Laidig, F.; Linstädter, A.; Macholdt, J.; Piepho, H.P., et al. Methods of yield stability analysis in long-term field experiments. A review. *Agronomy for Sustainable Development* **2021**, *(accepted)*.