Table S1. Pearson's correlation coefficients (R) among composition of tocopherols, oil content, macro and micro elements (2014).

	βT+γ	δT	TT	O	K	Na	Mg	Ca	P	Cr	Cu	Fe	Mn	Zn	Mo
αT	**0.89***	0.1	**1.00**	0.2	-	-	-	0.0	-0.02	0.0	0.5	0.4	0.15	0.60	0.3
βT+γ		0.2	**0.90**	0.2	0.1	-	-	0.0	-0.11	0.1	0.4	0.3	0.05	0.50	0.2
δT			0.16	0.2	-	-	-	-	-0.06	0.0	0.6	-	**-**	-	-
TT				0.2	-	-	-	0.0	-0.03	0.0	0.5	0.4	0.13	0.60	0.3
OC					0.0	0.3	-	0.3	**-**	0.0	0.2	-	-0.22	-	-
K						0.2	0.4	0.3	0.03	0.4	-	0.0	0.21	0.25	-
Na							0.0	0.5	-0.04	0.2	-	0.0	0.46	0.11	-
Mg								0.2	-0.03	-	0.3	0.2	0.16	0.24	-
Ca									-0.56	-	-	0.3	**0.77**	0.32	0.1
P										0.6	-	0.3	0.04	0.38	-
Cr											-	-	-0.18	0.14	-
Cu												0.1	-0.34	0.39	-
Fe													**0.77**	**0.88**	0.5
Mn														0.60	0.4
Zn															0.1

* significant at $p < 0.01$. αT—alpha tocopherol; βT+γT—beta + gamma tocopherol; δT—delta tocopherol; TT—total tocopherols; OC—oil content.

Table S2. Pearson's correlation coefficients (R) among composition of tocopherols, oil content, macro and micro elements with kernel morphological characteristics and climate parameters (2014).

	K	KL	KW	KT	KR	SV	SMD	AS	ASM	ADR	AAD	SMDR	ASMD
αT	-	0.1	-	-	-	0.2	0.34	-	0.26	-0.04	0.20	0.28	0.15
βT+	0.2	0.3	0.18	-	0.2	0.2	0.21	-	0.33	-0.31	0.31	0.21	0.21
δT	0.3	-	-	0.50	0.2	-	-0.35	0.34	**0.85***	0.05	**-0.71***	-0.43	-0.23
TT	-	0.1	-	-	0.0	0.2	0.33	-	0.27	-0.05	0.19	0.27	0.15
OC	0.3	0.0	0.50	0.53	0.6	0.5	**0.73***	**0.71**	0.33	0.50	-0.13	**-0.80***	-0.15
K	0.3	0.5	0.14	0.26	0.6	0.4	0.14	-	-0.10	**-0.72**	0.45	-0.12	-0.04
Na	-	-	0.04	-	0.1	0.4	0.67	0.25	-0.54	0.24	0.24	-0.34	-0.33
Mg	0.0	**0.7**	-	-	-	0.3	-0.13	-	0.29	-0.50	-0.29	0.12	0.46
Ca	0.0	0.5	0.50	-	-	**0.8**	0.74	-	-0.23	0.08	0.34	0.04	0.56
P	-	-	**-**	-	-	-	-0.50	-	-0.39	-0.52	0.25	0.50	-0.49
Cr	-	-	-	0.45	0.5	-	-0.06	-	-0.32	-0.39	0.42	-0.17	**-0.85***
Cu	0.0	0.4	-	-	-	0.3	0.08	-	**0.88***	-0.14	-0.58	-0.10	0.20
Fe	-	0.2	-	**-**	-	0.2	0.14	**-**	-0.26	-0.40	0.38	**0.83***	0.43
Mn	-	0.2	0.18	**-**	-	0.4	0.45	-	-0.63	-0.18	0.65	0.57	0.43
Zn	-	0.3	-	-	-	0.4	0.32	-	-0.08	-0.52	0.35	0.55	0.18
Mo	-	0.1	0.23	-	-	-	-0.22	-	-0.16	0.11	0.19	**0.75***	0.67

* significant at $p < 0.01$. αT - alfa tocopherol; βT+γT- beta + gamma tocopherol; δT—delta tocopherol; TT—total tocopherols; OC—oil content; KW—kernel weight; KL—kernel length; KWd— kernel width; KT—kernel thickness; KR—kernel ratio; SVR—the sum of precipitation during vegetation; SMDTV—the sum of mean daily temperatures during vegetation; ASP—the annual sum of precipitation; ASMDT—the annual sum of mean daily temperatures; ADRHV—average daily relative humidity during vegetation; AADRH—annual average daily relative humidity; SMDRHV—the sum of mean daily relative humidity during vegetation; ASMDRH—the annual sum of mean daily relative humidity.

Table S3. Pearson's correlation coefficients (R) among kernel morphological characteristics and climate parameters (2014).

	KL	KW	KT	KR	SVR	SM	ASP	AS	AD	AA	SMD	ASM
KW	0.49	0.69	0.61	0.57	0.06	-0.14	0.21	0.40	-0.07	-0.04	-0.36	0.31
KL		0.23	-0.22	0.05	0.64	0.15	-0.33	0.43	-0.45	-0.02	0.13	**0.76***
KWd			0.32	0.41	0.22	0.33	0.29	-0.17	0.30	0.39	-0.23	0.34
KT				**0.84***	-0.20	-0.10	0.53	0.23	0.13	-0.13	**-0.78***	-0.55
KR					0.24	0.27	0.29	0.12	-0.11	0.22	-0.69	-0.45
SVR						**0.83***	0.04	0.17	-0.04	0.09	-0.23	0.34
SMDTV							0.33	-0.09	0.37	0.19	-0.36	0.03
ASP								0.28	**0.86***	-0.55	**-0.84***	-0.26
ASMDT									0.04	**-**	-0.35	0.23
ADRHV										-0.39	-0.46	-0.08
AADRH											0.42	-0.04
SMDRH												0.45

* significant at $p < 0.01$. KW—kernel weight; KL—kernel length; KWd—kernel width; KT—kernel thickness; KR—kernel ratio; SVR—the sum of precipitation during vegetation; SMDTV—the sum of mean daily temperatures during vegetation; ASP—the annual sum of precipitation; ASMDT—the annual sum of mean daily temperatures; ADRHV—average daily relative humidity during vegetation; AADRH—annual average daily relative humidity; SMDRHV—the sum of mean daily relative humidity during vegetation; ASMDRH—the annual sum of mean daily relative humidity.

Table S4. Pearson's correlation coefficients (R) among composition of tocopherols, oil content, macro and micro elements (2015).

	βT+γ	**δT**	**TT**	**OC**	**K**	**Na**	**Mg**	**Ca**	**P**	**Cr**	**Cu**	**Fe**	**Mn**	**Zn**	**Mo**
αT	0.32	0.0	**1.00**	0.4	0.6	0.3	-	-	-	-	-	-0.46	-	0.27	0.43
βT+γ		0.2	0.35	0.1	-	-	-	0.2	-	-	-	**-**	-	-	0.40
δT			0.11	-	0.5	0.0	0.2	-	-	-	-	-0.20	-	0.61	**0.75**
TT				0.4	0.6	0.2	-	-	-	-	-	-0.48	-	0.27	0.45
OC					-	0.2	-	0.4	-	-	0.0	-0.29	0.1	-	-
K						0.4	0.2	-	0.1	-	-	0.00	-	**0.80**	0.60
Na							0.2	0.3	0.6	0.38	0.1	0.56	0.4	0.41	-
Mg								0.2	0.6	0.20	-	0.51	0.4	0.52	0.49
Ca									0.4	0.40	-	0.31	0.2	-	-
P										**0.81**	0.1	**0.93**	0.3	0.16	-
Cr											0.5	**0.91**	0.2	-	-
Cu												0.28	-	-	-
Fe													0.4	0.15	-
Mn														0.37	-
Zn															0.60

***** significant at $p < 0.01$. αT—alpha tocopherol; βT+γT—beta + gamma tocopherol; δT—delta tocopherol; TT—total tocopherols; OC—oil content.

Table S5. Pearson's correlation coefficients (R) among composition of tocopherols, oil content, macro and micro elements with kernel morphological characteristics and climate parameters (2015).

	K	**KL**	**K**	**KT**	**KR**	**SV**	**SMD**	**AS**	**ASM**	**ADR**	**AAD**	**SMDR**	**ASMD**
αT	-	-	-	0.03	0.02	-	-0.42	-	0.27	0.12	0.14	-0.05	0.02
βT+	0.2	-	-	0.31	0.23	**-**	0.21	-	0.50	0.28	0.11	-0.01	0.29
δT	-	0.6	-	-	-	-	-0.51	0.4	-0.27	-0.26	0.05	0.07	0.67
TT	-	-	-	0.03	0.02	-	-0.42	-	0.27	0.12	0.14	-0.05	0.04
OC	0.0	-	-	0.67	0.66	-	0.06	-	0.17	0.64	0.38	-0.11	-0.46
K	-	0.0	-	-	-	-	**-0.80***	0.0	-0.10	-0.25	0.03	-0.04	0.23
Na	0.0	0.1	-	0.19	0.39	0.38	**-0.78***	0.2	0.09	0.53	**0.72***	-0.66	-0.61
Mg	0.1	0.1	0.5	-	-	0.18	-0.10	0.3	0.11	-0.16	0.33	-0.64	-0.13
Ca	**0.7**	-	0.6	0.75	**0.77**	0.16	0.11	0.0	0.68	**0.83***	**0.73***	**-0.81***	**-0.77***
P	0.4	0.2	0.4	0.11	0.21	0.61	-0.38	0.0	0.36	0.28	0.47	**-0.78***	-0.68
Cr	0.6	0.3	0.4	0.34	0.39	**0.82**	-0.09	-	0.22	0.29	0.23	-0.47	**-0.71***
Cu	0.0	0.1	-	0.39	0.36	0.36	-0.29	-	0.07	0.10	-0.28	0.28	-0.28
Fe	0.4	0.2	0.4	0.05	0.14	**0.85**	-0.24	0.0	0.10	0.14	0.31	-0.59	-0.66
Mn	0.0	0.0	0.6	-	-	0.62	0.06	**0.7**	-0.47	0.12	0.48	-0.40	-0.30
Zn	-	0.1	-	**-**	-	0.02	-0.56	0.5	-0.53	-0.43	0.07	-0.05	0.34
Mo	-	0.0	-	-	-	-	-0.18	0.2	-0.07	-0.44	-0.08	0.04	0.66

* significant at $p < 0.01$. αT—alfa tocopherol; βT+γT—beta + gamma tocopherol; δT—delta tocopherol; TT—total tocopherols; OC—oil content; KW—kernel weight; KL—kernel length; KWd—kernel width; KT—kernel thickness; KR—kernel ratio; SVR—the sum of precipitation during vegetation; SMDTV—the sum of mean daily temperatures during vegetation; ASP—the annual sum of precipitation; ASMDT—the annual sum of mean daily temperatures; ADRHV—average daily relative humidity during vegetation; AADRH—annual average daily relative humidity; SMDRHV—the sum of mean daily relative humidity during vegetation; ASMDRH—the annual sum of mean daily relative humidity.

Table S6. Pearson's correlation coefficients (R) among kernel morphological characteristics and climate parameters (2015).

	KL	KW	KT	KR	SV	SMD	AS	ASM	ADR	AAD	SMDR	ASMD
KW	0.4	0.62	0.6	0.6	0.2	0.17	-	0.53	0.64	0.48	-0.58	-0.52
KL		0.14	-	0.0	0.1	-0.34	0.4	-0.27	0.12	0.25	-0.11	0.25
KWd			0.0	0.1	0.4	0.50	0.3	0.10	0.20	0.40	-0.57	-0.36
KT				**0.9**	0.0	0.05	-	0.63	**0.85***	0.41	-0.33	-0.67
KR					0.1	-0.14	-	0.53	**0.94***	0.60	-0.45	-0.69
SVR						0.04	0.0	-0.25	0.05	0.12	-0.25	-0.58
SMDT							-	-0.01	-0.26	-0.42	0.30	0.11
ASP								-0.59	0.11	0.54	-0.26	0.22
ASMD									0.49	0.25	-0.52	-0.53
ADRH										**0.82***	-0.64	-0.66
AADR											**-0.85***	-0.54
SMDR												**0.70***

* significant at $p < 0.01$. KW—kernel weight; KL—kernel length; KWd—kernel width; KT—kernel thickness; KR—kernel ratio; SVR—the sum of precipitation during vegetation; SMDTV—the sum of mean daily temperatures during vegetation; ASP—the annual sum of precipitation; ASMDT—the annual sum of mean daily temperatures; ADRHV—average daily relative humidity during vegetation; AADRH—Annual average daily relative humidity; SMDRHV—the sum of mean daily relative humidity during vegetation; ASMDRH—the annual sum of mean daily relative humidity.