

**Table S1.** Principal component eigenvector, eigenvalue, contribution rate and accumulative contribution rate of eight tartary buckwheat varieties at flowering stage.

Indicators	Main composition	
	PC1	PC2
EE	0.829	0.421
NDF	-0.794	-0.249
NFE	-0.789	0.093
calcium	0.750	-0.548
ADF	-0.718	0.648
phosphorus	0.640	-0.390
rutin	0.460	0.828
total flavonoids	0.485	0.809
CF	0.283	-0.493
CP	0.481	0.037
Eigenvalue	4.184	2.705
Contribution rate (%)	41.839	27.049
Cumulative contribution ratio (%)	41.839	68.888

PC: principal components; CP: crude protein; CF: crude fiber; EE: crude fat, ether extract; ADF: acid detergent fiber; NDF: neutral detergent fiber; NEF: nitrogen free extract.

**Table S2.** Principal component eigenvector, eigenvalue, contribution rate and accumulative contribution rate of eight tartary buckwheat varieties at pustulation stage.

Indicators	Main composition	
	PC1	PC2
NFE	-0.888	0.336
NDF	-0.832	0.210
CP	0.691	-0.183
CF	0.638	0.373
rutin	0.329	0.829
total flavonoids	0.530	0.744
EE	0.448	-0.716
phosphorus	0.144	0.249
ADF	-0.263	0.256
calcium	-0.362	-0.128
Eigenvalue	3.177	2.226
Contribution rate (%)	31.768	22.257
Cumulative contribution ratio (%)	31.768	54.025

PC: principal components; CP: crude protein; CF: crude fiber; EE: crude fat, ether extract; ADF: acid detergent fiber; NDF: neutral detergent fiber; NEF: nitrogen free extract.

**Table S3.** Principal component eigenvector, eigenvalue, contribution rate and accumulative contribution rate of eight tartary buckwheat varieties at mature stage.

Indicators	Main composition	
	PC1	PC2
calcium	0.864	0.051
CF	-0.86	-0.106
EE	0.854	-0.39
total flavonoids	0.709	0.35
NFE	0.702	-0.21
phosphorus	0.682	0.181
NDF	-0.45	0.427

CP	0.187	0.896
ADF	0.323	0.801
rutin	0.376	-0.693
Eigenvalue	4.160	2.472
Contribution rate (%)	41.602	24.717
Cumulative contribution ratio (%)	41.602	66.319

PC: principal components; CP: crude protein; CF: crude fiber; EE: crude fat, ether extract; ADF: acid detergent fiber; NDF: neutral detergent fiber; NEF: nitrogen free extract.

**Table S4.** Comprehensive scoring of principal component values of eight tartary buckwheat varieties at flowering stage.

Varieties	Score			Rank
	F1	F2	Dn	
M-09125	-1.231	-2.395	-1.107	8
XQ-1	0.494	-0.234	0.132	4
BY	-0.414	0.072	-0.135	6
EWPS	0.143	0.973	0.300	3
ZK-1	0.044	0.182	0.011	5
PS-07	0.073	1.101	0.506	2
CQ-3	1.383	1.150	0.627	1
YQ-1	-0.492	-0.849	-0.424	7

M-09125: Meng-09125; XQ-1: Xiqiao No.1; BY: Buyue; EWPS: Ewu Pedgree selection; ZK-1: Zhaoku No.1; PS-07: Pedgree selection-07; CQ-3: Chuanqiao No.3 and YQ-1: Youqiao No.1.

**Table S5.** Comprehensive scoring of principal component values of eight tartary buckwheat varieties at pustulation stage.

Varieties	Score			Rank
	F1	F2	Dn	
M-09125	0.192	2.008	0.832	1
XQ-1	0.844	-2.742	-0.218	7
BY	3.116	0.435	0.113	4
EWPS	-0.310	-0.729	-0.629	8
ZK-1	-0.725	0.173	0.133	2
PS-07	-1.341	0.973	-0.190	6
CQ-3	-2.261	-0.629	-0.115	5
YQ-1	0.485	0.511	-0.022	3

M-09125: Meng-09125; XQ-1: Xiqiao No.1; BY: Buyue; EWPS: Ewu Pedgree selection; ZK-1: Zhaoku No.1; PS-07: Pedgree selection-07; CQ-3: Chuanqiao No.3 and YQ-1: Youqiao No.1.

**Table S6.** Comprehensive scoring of principal component values of eight tartary buckwheat varieties at mature stage.

Varieties	Score			Rank
	F1	F2	Dn	
M-09125	-1.357	-0.951	-0.933	6
XQ-1	0.065	1.547	0.536	2
BY	-1.443	-1.242	-0.961	7
EWPS	0.485	0.647	0.326	5
ZK-1	0.490	0.679	0.371	4
PS-07	1.167	0.266	0.452	3
CQ-3	1.998	0.902	1.050	1
YQ-1	-1.405	-1.848	-0.995	8

M-09125: Meng-09125; XQ-1: Xiqiao No.1; BY: Buyue; EWPS: Ewu Pedgree selection; ZK-1: Zhaoku No.1; PS-07: Pedgree selection-07; CQ-3: Chuanqiao No.3 and YQ-1: Youqiao No.1.