



## Data Article

# Agromorphological traits dataset of butterfly pea accessions from Thailand, Indonesia, and Brazil



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## ABSTRACT

Butterfly pea (*Clitoria ternatea* L.) is a horticultural crop also known as underutilized crop. All parts of the butterfly pea can be used into various products including flowers that can be used as natural dyes and traditional medicines. Besides that, the plant parts can be used as fodder and cover crop. The development of butterfly pea in Indonesia is still very low both in cultivation and utilization. Therefore, a breeding program is required to increase usefulness of butterfly pea can be done for the development. To assemble superior varieties of butterfly pea, it is necessary to determine the genetic diversity of both in agronomy and morphology. Genetic diversity and relationships are needed to evaluate plant germplasm. Raw data analysis was conducted after standardization using Principal Component Analysis (PCA) and Hierarchical Clustering Analysis (HCA) to determine phenotypic diversity and relationship among the newly collected genetic resources. The data in this article showed broad phenotypic diversity with weight of fresh flower per plant, seed color, weight of total seed, pod width, calix length, flower color, petal number, number of total pods, plant height, number of seed per pod, weight total fresh flower, seed width, weight

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of fresh flower per plant, and seed length as distinguishing traits among the accessions. PCA based on agromorphological traits showed eigenvalue ranged from 1.13 to 9.47 with a cumulative contribution of 93.02%. HCA showed butterfly pea accessions divided into two cluster with euclidean distance 0.27–4.65.

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## Specifications Table

Subject	Data Article (Agricultural and Biological Science)
Specific subject area	Agricultural and Biological Science (general). Agronomy and Crop Science
Data format	Raw, Analyzed
Type of data	Table, Image, Figure
Data collection	Raw data were acquired as the result of observations, measurements, and sampling in the field and after harvesting. Instruments: Microsoft Excel 2013, NTSyspc version 2.11x
Data source location	Ciparanje Experimental Field Institution: Universitas Padjadjaran City/Town/Region: Sumedang Regency. West Java Country: Indonesia Latitude and longitude for collected samples/data: 6°55' 0.72804" S latitude and 107°46' 18.46056" E longitude The mean temperature was 22.6 °C and the mean humidity was 90.1%.
Data accessibility	Repository name: Mendeley Data Data identification number: <a href="https://data.mendeley.com/datasets/gxxjmw6gnc/1">10.17632/gxxjmw6gnc.1</a> Direct URL to data: <a href="https://data.mendeley.com/datasets/gxxjmw6gnc/1">https://data.mendeley.com/datasets/gxxjmw6gnc/1</a>

## 1. Value of the Data

- The dataset provides information about the genetic diversity of butterfly pea germplasm collection.
- The dataset in this article provides information about the defining characteristics among butterfly pea accessions studied. The information can be used further for research, crop production, and/or industrial purpose.
- The dataset provided in this article can be used in genetic studied and breeding programs of butterfly pea, especially the assembly of new varieties targeted to industrial purposes specified in natural dyes, herbal based health products, and others.

## 2. Data description

This data article contains data from 14 butterfly pea accessions (Table 1) with 29 agromorphological traits observed. The traits were composed of 23 quantitative and 6 qualitative traits which were described in Table 2. Observation result showed some unique characteristics that is diverse in different origin. For example variation in the structure of petal number butterfly

**Table 1**

List of butterfly pea accessions.

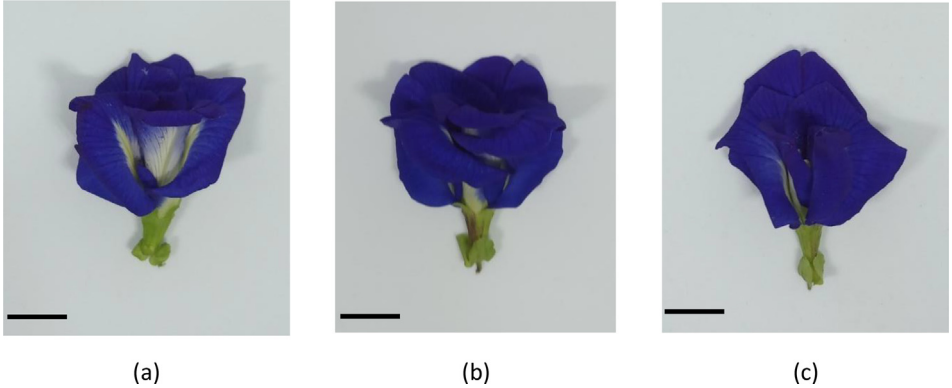
Accession	Origin
CT8.2	Thailand
CT8.3	Thailand
CT12.2	Bali, Indonesia
CT12.3	Bali, Indonesia
CT12.3 B	Bali, Indonesia
CT12.4	Bali, Indonesia
CT12.4 B	Bali, Indonesia
CT12.5	Bali, Indonesia
CT12.7	Bali, Indonesia
CT12.7 B	Bali, Indonesia
CT24.1	East Java, Indonesia
Check accession	
CT4.3	West Java, Indonesia
CT38	Brazil
CT51	Thailand

**Table 2**

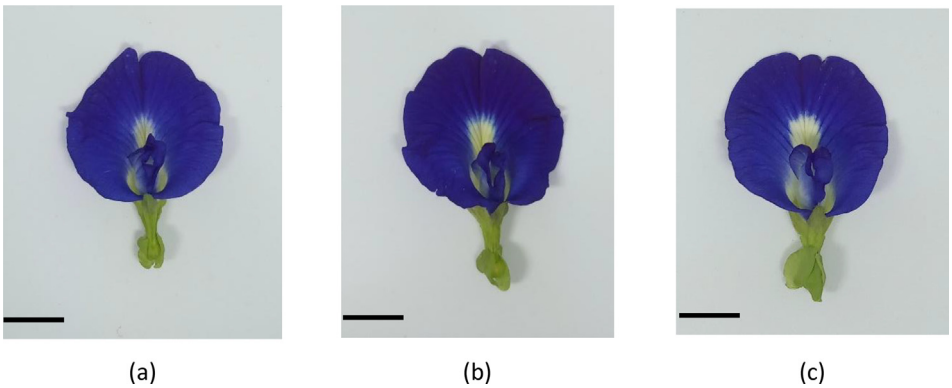
List of traits observed.

Trait	Abbreviation	Type
Plant Height (cm)	pH	Quantitative
Leaf Length (cm)	LL	Quantitative
Leaf Width (cm)	LWi	Quantitative
Flowering Age (Days After Planting/DAP)	FA	Quantitative
Flower Length (cm)	FL	Quantitative
Flower Width (cm)	FWi	Quantitative
Weight of 1 Fresh Flower (g)	W1FF	Quantitative
Calix Length (cm)	CL	Quantitative
Weight of Fresh Flower per Plant (g)	WFFP	Quantitative
Weight of Total Fresh Flower (g)	WTFP	Quantitative
Pod Length (cm)	PL	Quantitative
Pod Width (mm)	PWi	Quantitative
Number of Pods per Plant (unit)	NPP	Quantitative
Weight of Pods per Plant (g)	WPP	Quantitative
Number of Total Pods (unit)	NTP	Quantitative
Weight of Total Pods (g)	WTP	Quantitative
Seed Length (mm)	SL	Quantitative
Seed Width (mm)	SWI	Quantitative
Seed Diameter (mm)	SD	Quantitative
Number of Seed per Pod (unit)	NSP	Quantitative
Weight of Seed per Plant (g)	WSP	Quantitative
Weight of Total Seed (g)	WTS	Quantitative
Weight of 100 Seeds (g)	W100S	Quantitative
Petal Number	PN	Qualitative
Number of Leaves	NL	Qualitative
Leaf Shape	LS	Qualitative
Flower Color	FC	Qualitative
Seed Color	SC	Qualitative
Seed Shape	SS	Qualitative

pea from East Java (Fig. 1a), Bali (Fig. 1b), and Thailand (Fig. 1c) including have double petal. Meanwhile in Fig. 2 butterfly pea accessions from West Java (Fig 2.a), Bali (Fig. 2b), and Brazil (Fig. 2c) have single petal. Flowers of butterfly pea is typical papilionaceous zygomorphic type [1,2]. Similar studies were previously conducted with result of high diversity of butterfly pea in specific areas based on flower morphology [3]. Another study also reported that high diversity based on agromorphological traits was showed in 38 butterfly pea germplasm from Indonesia [4,5].



**Fig. 1.** Petal number appearance of butterfly pea: (a) CT24.1 from East Java; (b) CT12.3B from Bali; (c) CT8.3 from Thailand. Scale bar. 3 cm.



**Fig. 2.** Petal number appearance of butterfly pea: (a) CT4.3 from West Java; (b) CT12.7 from Bali; (c) CT38 from Brazil. Scale bar. 3 cm.

**Table 3**

Result of PCA on butterfly pea accessions.

Traits	PC-1	PC-2	PC-3	PC-4	PC-5	PC-6	PC-7	PC-8
pH	-0.3284	-0.3552	<b>0.6492</b>	0.4688	-0.2960	0.1716	<b>0.7935</b>	-0.1126
LL	0.3992	0.3127	0.4139	<b>-0.6265</b>	0.1653	0.2226	<b>0.5571</b>	-0.1923
LWi	0.4376	0.2168	0.2256	<b>-0.7106</b>	-0.4153	0.4829	<b>-0.7073</b>	0.2842
FA	0.2159	0.4078	-0.4894	-0.4892	-0.1632	-0.3921	-0.2469	-0.3191
FL	<b>-0.6505</b>	-0.3533	-0.1629	-0.4687	<b>0.6058</b>	-0.1127	0.1774	-0.3109
FWi	0.2719	<b>-0.8055</b>	0.2742	-0.2729	-0.1534	-0.1316	0.2962	-0.1730
W1FF	<b>0.5216</b>	<b>-0.5929</b>	-0.1096	<b>-0.9492</b>	0.2430	0.1816	-0.1557	-0.4842
CL	<b>0.8141</b>	-0.2336	0.3697	0.2504	<b>0.6828</b>	<b>-0.6207</b>	0.1297	-0.4303
WFFP	<b>0.7142</b>	-0.2603	<b>0.5205</b>	<b>0.9768</b>	-0.1856	-0.2236	-0.1577	-0.3752
WTFP	0.4773	-0.3997	<b>0.6321</b>	0.3879	0.2826	-0.3212	-0.1259	-0.1733
PL	0.1817	-0.4134	-0.4391	-0.4471	-0.4823	0.1226	-0.2551	0.2650
PWi	<b>0.6523</b>	-0.3686	<b>0.8682</b>	-0.1194	<b>-0.8063</b>	-0.3794	<b>-0.7463</b>	0.4805
NPP	<b>-0.9345</b>	-0.1075	0.2769	-0.3447	-0.2368	<b>0.5088</b>	-0.1878	0.1196
WPP	<b>-0.8477</b>	-0.2845	0.1258	<b>-0.8024</b>	-0.1957	<b>0.6667</b>	-0.2983	<b>-0.8298</b>
NTP	<b>-0.8750</b>	-0.2982	0.4420	<b>0.6407</b>	-0.1400	0.1313	<b>-0.9596</b>	0.2582
WTP	<b>-0.8298</b>	-0.2151	0.3576	-0.1008	<b>-0.8566</b>	<b>0.8758</b>	-0.2422	0.3364
SL	<b>0.5095</b>	-0.1707	-0.2895	0.4885	-0.2397	<b>0.6964</b>	-0.1474	0.1322
SWi	<b>0.5245</b>	<b>-0.6141</b>	0.2918	-0.2751	<b>0.5718</b>	0.2740	-0.2054	0.2598
SD	0.4678	-0.4558	-0.3730	0.3033	0.4915	0.4954	-0.1410	-0.1331
NSP	<b>-0.7276</b>	0.3976	<b>0.6413</b>	-0.2822	<b>0.9290</b>	0.2529	<b>-0.8355</b>	0.1704
WSP	<b>-0.9069</b>	-0.2707	0.2421	<b>-0.8365</b>	<b>0.5566</b>	<b>0.7797</b>	-0.1603	<b>0.5421</b>
WTS	<b>-0.9137</b>	-0.2281	0.2653	0.3053	0.2227	0.1623	-0.4242	-0.2243
W100S	0.2955	<b>-0.7652</b>	-0.3619	<b>0.9189</b>	0.2298	0.1813	-0.1056	-0.1899
PN	<b>0.6544</b>	0.2557	0.4201	0.2468	0.1349	0.2635	0.2206	0.1047
NL	-0.3406	<b>-0.6138</b>	-0.3919	-0.2447	0.1065	-0.2291	0.3816	0.1379
LS	0.2081	-0.2335	-0.3674	0.4648	<b>-0.5981</b>	<b>-0.5347</b>	<b>-0.7529</b>	-0.3089
FC	-0.2445	<b>0.8131</b>	-0.4863	0.2300	0.4313	-0.3888	-0.4010	0.3187
SC	<b>0.7240</b>	<b>0.8937</b>	<b>0.9584</b>	0.1640	0.1938	-0.1083	-0.4687	-0.3097
SS	-0.1226	0.1877	<b>-0.9633</b>	0.4341	<b>-0.8292</b>	<b>-0.7561</b>	<b>0.7343</b>	-0.1587
Eigenvalue	9.4730	4.3203	4.1194	2.8153	2.2989	1.6281	1.1940	1.1275
Percentage (%)	32.6656	14.8977	14.2049	9.7081	7.9274	5.6142	4.1173	3.8880
Cumulative (%)	32.6656	47.5633	61.7682	71.4763	79.4037	85.0179	89.1353	93.0233

Description: Bolded and shaded numbers are influential character values because factor loading is  $\geq 0.5$ ; PC = Principal Component; PH = Plant height; LL = Leaf length; LWi = Leaf width; FA = Flowering age; FL = Flower length; FWi = Flower width; W1FF = Weight of 1 fresh flower; CL = Calix length; WFFP = Weight of fresh flower per plant; WTFP = Weight of total fresh flower; PL = Pod length; PWi = Pod width; NPP = Number of pods per plant; WPP = Weight of pods per plant; NTP = Number of total pods; WTP = Weight of total pods; SL = Seed length; SWi = Seed width; SD = Seed diameter; NSP = Number of seed per pod; WSP = Weight of seed per plant; WTS = Weight of total seed; W100S = Weight of 100 seeds; PN = Petal number; NL = Number of leaves; LS = Leaf shape; FC = Flower color; SC = Seed color; SS = Seed shape

Table 3 showed that the high variation among the analysed data based on cumulative variation percentage of 93.02%. There are 8 PCs that have an eigenvalue of one and contribution to the diversity among accessions. The first four PCs in the Table 3 showed weight of fresh flower per plant, seed color, weight of total seed, pod width, calix length, flower color, petal number, number of total pods, plant height, number of seed per pod, weight of total fresh flower, seed width, weight of fresh flower per plant, and seed length as contributed maximum towards di-

versity and as differentiation among accessions as the traits. Fig. 3 showed that the biplot of the result from PCA in two-dimensional way based on the first and second PCs. Based on the result all accessions scattered in all quadrants of the biplot.

Fig. 4 showed the dendrogram as the result of Hierarchical Clustering Analysis (HCA) based on agromorphological traits. Cluster analysis showed butterfly pea accessions divided into two cluster i.e. class A and class B with euclidean distance of 0.27–4.65 which considered as the accessions has the board relationship among accessions test. The most similar accessions were CT12.2 and CT12.7, this is due to the parent sources of both accessions are from Bali.

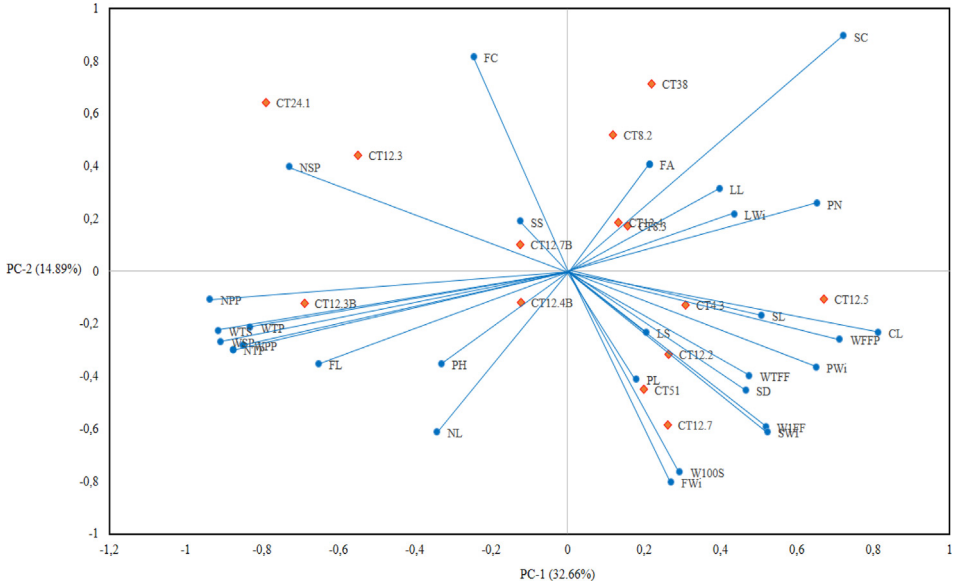


Fig. 3. Biplot of butterfly pea accessions based on the first and second PC.

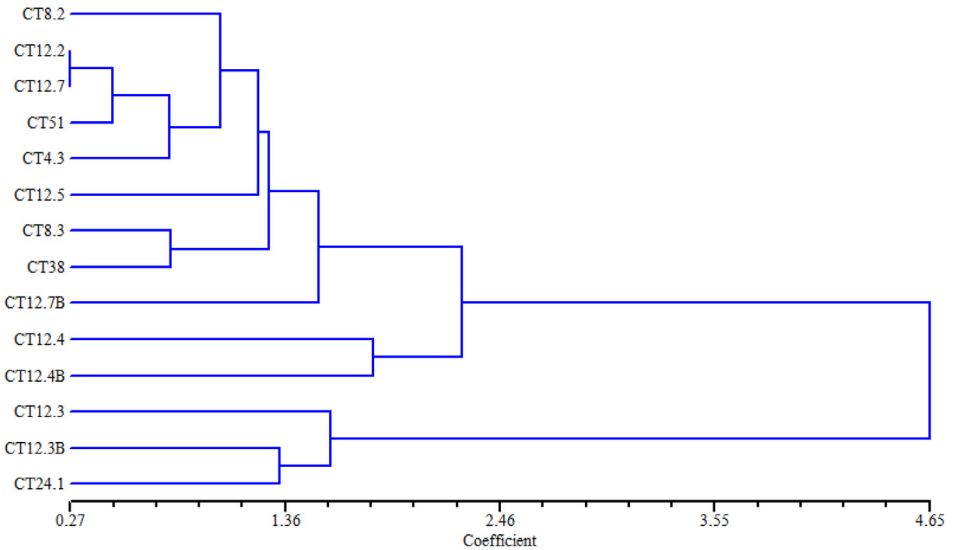


Fig. 4. Dendrogram of butterfly pea accessions.

### 3. Experimental Design, Materials and Methods

All the accessions were planted at Ciparanje Experimental Field, Faculty of Agriculture, Universitas Padjadjaran from November 2021 to September 2022. The site was located at the altitude of 753 m above sea level and on 6°55′0.72804″ S latitude and 107°46′ 18.46056″ E longitude. The soil type was described as inceptisols with clay texture. The mean temperature during this experiment was 22.6 °C and the mean humidity was 90.1%.

This experiment was arranged using a randomized block design [6] with three replications and three check accessions as comparison to adjust the availability of each accessions. Each accession was planted in one row with five plants on each row. The plant spacing was 1 × 1 m. Before planting, seeds are first sown, and after they have grown sufficiently, they are transferred to the main field. The harvested time was conducted in 4 months after planting.

The data in this experiment was collected on 45 days after planted and after harvested time [7]. The data was collected by measuring agromorphological traits (Table 2). Three plant samples were taken from each plot (accession) for measurement and observation. The tools used were digital scale, measure tape, caliper, and color chart using Royal Horticultural Society Colour Charts [8].

Estimation of phenotypic diversity was conducted used a Principal Component Analysis (PCA) and Hierarchical Clustering Analysis was conducted to estimated the phenotypic relationship [9]. Both analysis were performed using NTSyspc version 2.11x [10].

#### Limitations

Not applicable.

#### Ethics Statement

We all the authors have read and follow the ethical requirements for publication in Data in Brief and confirm that the current work does not involve human subjects, animal experiments, or any data collected from social media platforms.

#### Data Availability

[Data of Observed Traits of Butterfly Pea \(Original data\)](#) (Mendeley Data)

#### CRediT Author Statement

**M.B. Mustapa:** Formal analysis, Investigation, Writing – original draft; **D. Ustari:** Conceptualization, Methodology, Data curation, Writing – review & editing; **A.A. Wicaksono:** Formal analysis, Writing – review & editing, Visualization; **A. Algina:** Investigation; **A. Ismail:** Validation, Supervision; **V. Concibido:** Project administration, Funding acquisition; **T. Suganda:** Validation, Supervision; **A. Karuniawan:** Conceptualization, Supervision, Funding acquisition.

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## Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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