

Overview of pigeonpea research in Myanmar

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Abstract: Pigeonpea (*Cajanus cajan* (L.) Millsp.) is the third most important pulse in Myanmar. Aberrant weather and climatic abnormalities significantly reduced the crop productivity in present-day rain-fed agriculture. Adoption of location-specific short and medium duration varieties as well as hybrids are needed to improve livelihood of vulnerable small holders. Monywa Shwedindar is a popular variety which has been selected by using pedigree method from naturally out-crossing local landraces. In 2013, ICPH 2433 (2507 kg ha⁻¹) showed 62.41% yield superiority over standard check, Yezin-3. In 2014, ICPL 2039 x Line-25 (2239 kg ha⁻¹) exhibited 57% yield superiority over ICPL 88039. These findings showed the prospects in enhancing the productivity of pigeonpea in Myanmar.

Key words: hybrid pigeonpea, landraces, Myanmar

Introduction

Myanmar is predominantly an agricultural country and pulses play an important role in its economy. Myanmar is the world's second largest exporter of pulses with the exports crossing 1.45 million t mark annually. Pigeonpea (*Cajanus cajan* (L.) Millsp.) is the third most important pulse crop and grown exclusively for export. According to Department of Agricultural Planning under the Ministry of Agriculture and Irrigation, the area of pigeonpea is 643,000 ha in 2013-

2014 covering about 14% of total pulses production. It is mainly cultivated as an intercrop with cotton (*Gossypium hirsutum* L.), groundnut (*Arachis hypogaea* L.), sesame (*Sesamum indicum* L.), green gram (*Vigna radiata* (L.) R. Wilczek), and sunflower (*Helianthus annuus* L.) in Sagaing, Mandalay and Magway regions of Central Dry Zone of Myanmar. Although the Department of Agricultural Research (DAR) had been released some improved varieties, the yield level of pigeonpea is still stagnating. To promote the productivity of pigeonpea in the country, the researchers explored various options and believe that adoption of hybrid breeding technology can provide the derived answer.

Varietal improvement programme

Myanmar has strong collaboration with ICRISAT since 1976 and more than 400 pigeonpea breeding materials have been introduced from ICRISAT and six improved varieties had been released for commercial cultivation (Table 1). Since the inheritance of yield and associated characters is confounded with the effects of phenology in pigeonpea (Saxena, 2008) and its phenology is highly influenced by photoperiod, temperature, and their micro-climatic interactions, local landraces have wider adaptability than improved varieties. Monywa Shwedindar is a popular variety in the country which has been selected by using pedigree method from naturally out-crossing local landraces.

Traditionally, pigeonpea is mainly grown under rain-fed cultivation by using traditionally long-duration (> 200 days) varieties and the crop has to face most vulnerable to vagaries of weather. As a result of which partial or total crop failure has become very common leading to a significant yield reduction and great economic loss to the farmers. Thus to prevent the farming communities from economic loss due to vagaries of weather and climatic abnormalities, the plant breeders have realized the need to develop high-

Table 1. Pigeonpea varieties released in Myanmar

Serial number	Genotype	Released name
1.	HPA-1	Yezin-1
2.	BR-172	Yezin-2
3.	ICPL-87	Yezin-3
4.	ICPL 93003	Yezin-4
5.	ICPL 87119	Yezin-5
6.	ICPL 96061	Yezin-6

yielding short duration lines with wide adaptability and yield stability that can escape serious drought in June-July and terminal drought in reproductive stage to enhance the crop productivity and to diversify the legume-based cropping systems. Currently, ICRISAT short duration varieties ICPL 88039, ICPL 87, UPAS 120, ICPL 98010 and ICPL 98015 have been replaced in the drought prone area of Magway and Mandalay regions.

Hybrid breeding. Hybrid breeding technology had been introduced from ICRISAT in 2007 and ICPH 2671, ICPH 2740, and ICPH 3461 had been identified as promising across over three research stations in 2008-2009 (Fig. 1). Subsequently, the hybrid ICPH 2671 and ICPH 2740 were demonstrated in farmers' field across over six location and were found to be 28% - 41% superior in yield over the control in six townships of Sagaing and Mandalay regions during 2009-2010 (Fig. 2). However, due to its purple seed coat color ICPH 2671 was not preferred by farmers and local brokers. ICPH 3461 and ICPH 2740 showed good yields with the preferred seed color. However, due to its photo and thermo sensitivity, these hybrids were late in maturity and pod setting was affected at low temperature, dropping of flowers and serious attacked by pod fly than local. Therefore the plant breeders considered to develop indeterminate type short duration hybrids which have photo and thermo insensitivity and suitable for different cropping system. In 2013, 10 short duration ICRISAT pigeonpea hybrids were conducted the experiment by

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Figure 1. Performance of pigeonpea hybrids at Myingyan, Sebin and Zaloke Research Farms in Myanmar, 2008-2009

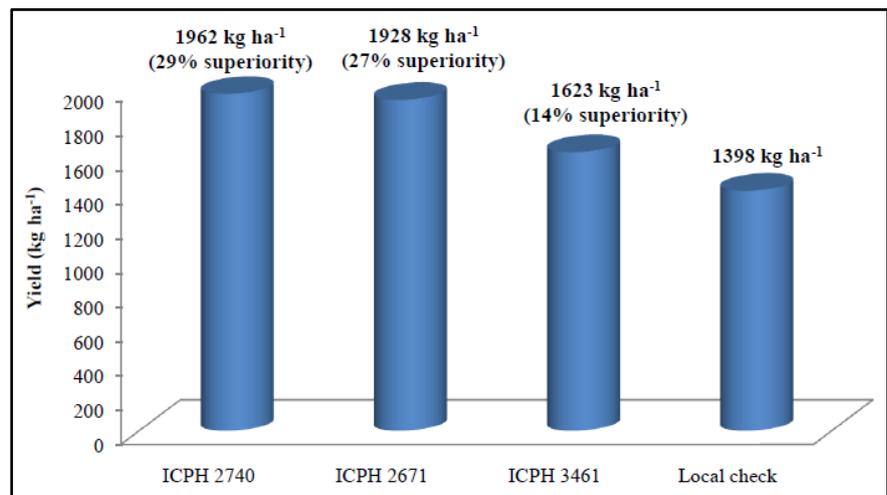
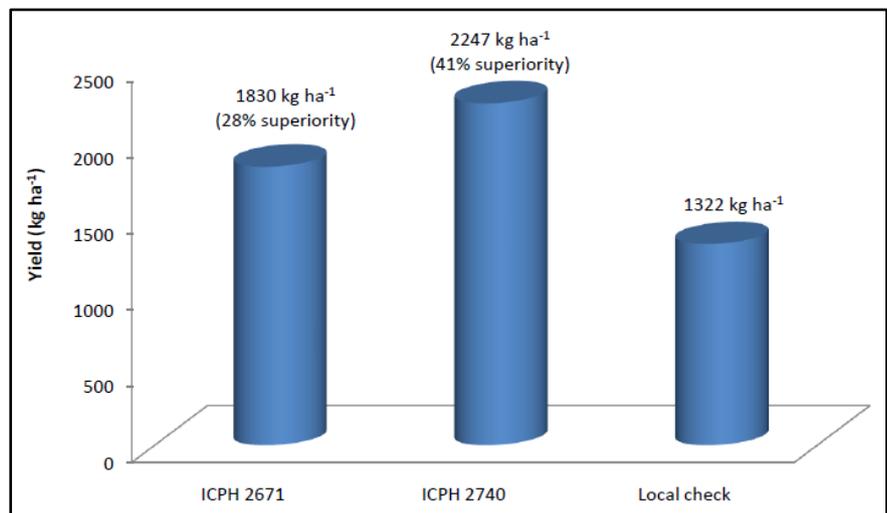


Figure 2. Performance of pigeonpea hybrids in farmers' fields across over six locations in Myanmar, 2009-2010



using 10 m × 2 m RBD at Yezin. ICPH 2433 (2507 kg ha⁻¹) was fully fertile and showed significant yield superiority (62.41%) over standard check, Yezin-3 (Table 2). In 2013, ICRISAT short duration CMS line ICPA 2039 was crossed with locally adapted germplasm lines; Layphatwai, Line-25, UPAS-120, Nyaungoo (MD) and Yezin-3. These combinations were screened at Zaloke research farm in 2014 monsoon season. The combination, ICPA 2039 × Line-25 (2239 kg ha⁻¹) restored 93% fertility in F₁ and exhibited 57% yield superiority over ICPL 88039 (Table 3). These findings showed the performance of short duration hybrids and their prospects in enhancing the productivity of pigeonpea in Myanmar.

Hybrid seed production. Hybrid seed production was also established successfully in the country. The first hybrid seed (A × R) production of ICPH 2671 was initiated at Tatkone and Pankone research farms in 2008-09 and produced 1069 kg ha⁻¹ of hybrid seed. During 2009-2010 seed production of the selected hybrids was undertaken using a row ratio of 3 female: 1 male, which produced 1569 kg ha⁻¹ of ICPH 2740 and 2931 kg ha⁻¹ of ICPH 3461. Therefore, it seems it may not be any problem for short duration pigeonpea hybrid seed production.

Conclusions

In Myanmar, pigeonpea is a favourite crop of small holder farmers in the dry zone area due to its multiple uses and its role in sustainable agriculture. Aberrant weather and climate abnormalities significantly reduce the crop productivity in present-day rainfed agriculture. Therefore, proper planning and adoption of location-specific pigeonpea short and medium duration varieties as well as hybrid varieties are needed to improve livelihood of vulnerable small holders. 🌱

Table 2. Performance of various morphological traits and yield attributes of short duration pigeonpea hybrids and check at Zaloke Research Farm, Sagaing Region, Myanmar, in 2014

Parentage	Number of days to maturity	Number of pods (plant ⁻¹)	Plot yield (g)	100-seed weight (g)	Yield (bsk ac ⁻¹)	Yield (kg ha ⁻¹)	Fertility restoration (%)	Yield superiority over check (%)
ICPA 2039 × Layphatwai	131	307	976	8.0	21.7	1754	82	22.7
ICPA 2039 × Line 25	128	281	1248	9.5	27.7	2239	93	56.9
ICPA 2039 × UPAS 120	115	360	1177	10.0	26.1	2110	88	48
ICPA 2039 × Nyaungoo (MD)	130	272	703	8.5	15.6	1261	40	
ICPA 2039 × Yezin-3	116	190	200	10.0	4.4	356	14	
ICPL 88039 (C)	126	253	795	8.5	17.7	1431		
Mean	124	277	850	9.0	18.9	1528		
CV (%)	5.7	20.4	24.9	9.5		20.8		
SE (±)	2.6	3.1	8.0	0.4	0.48	39		

Table 3. Performance of various morphological traits and yield attributes of short duration pigeonpea hybrids and check at Yezin, Nay Pyi Taw, Myanmar, in 2013

Hybrid	Number of days to 50% flower	Number of days to maturity	Plant height (cm)	Number of pods (plant ⁻¹)	Number of seeds (pod ⁻¹)	100-seed weight (g)	Number of primary branches (plant ⁻¹)	Number of secondary branches (plant ⁻¹)	Plant stand (13.5' × 10')	Yield (kg ha ⁻¹)	Yield superiority over check (%)	Fertility restoration (%)
ICPH 2441	115	149	159	256	3.5	7.7	13	6	24	1048		77
ICPH 3310	114	148	139	254	3.4	7.5	11	3	24	1055		91
ICPH 2438	117	151	149	459	3.5	7.7	12	7	26	1228		94
ICPH 2447	116	150	146	288	3.4	8.4	12	5	22	930		90
ICPH 2429	117	151	161	448	3.5	8.1	13	6	25	1476		95
ICPH 2431	117	151	172	503	3.2	7.9	14	13	26	1672		87
ICPH 2433	116	150	173	559	3.0	8.1	13	10	21	2507	62.41	100
ICPH 2363	122	156	170	500	3.4	8.8	15	9	24	1344		92
ICPH 2364	115	149	146	353	3.5	8.9	11	7	23	1304		100
Yezin-3 (C)	115	149	94	235	3.4	8.3	12	10	20	1544		
Mean	116	150	151	386	3.4	8.1	13	8	23	1411		
SE(±)	1.8	1.7	18.0	169.8	0.3	0.7	3.2	5.6	5.4	58		
CV%	0.9	0.7	6.9	15.7	5.4	4.7	14.6	21.9	13.6	17.9		

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