### Pumpkin (Cucurbita moschata Duch. ex Poir.)

#### I. Subject

These test guidelines apply to all varieties, hybrids and parental lines of pumpkin (*Cucurbitamoschata*Duch. ex Poir.)

#### II. Seed material required

- 1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) shall decide when, where and in what quantity and quality the seed material required for testing the variety is to be delivered. Applicants submitting material from a country other than India must make sure that all customs formalities are complied with.
- 2. The minimum quantity of seed to be supplied by the applicant should be:

Varieties, Hybrids and parental lines

- For open field cultivation: 200g or 1500 seeds (in one submission only)
- 3. The seed should meet the minimum requirements for germination capacity (80%), moisture content (<8%) and physical purity (98%) prescribed for certified seed in India. Especially for storage, which requires a higher standard, the applicant should state the actual germination capacity, which should be as high as possible. The seed supplied should be visibly healthy, not lacking in vigour or affected by any important pest or disease.
- 4. The seed material must not have undergone any treatment unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

#### **III.** Conduct of tests

- 1. The minimum duration of tests should normally be two independent but similar growing seasons with reference to the eco-system of the variety submitted for DUS test.
- 2. The test should normally be conducted at two different locations. If any essential characteristics of the variety can not be observed at these places, the variety may be tested at an additional place.
- 3. The test should be carried out under conditions ensuring normal growth. The size of the plot should be such that plants or parts of plant may be removed for measuring and counting without prejudice to the observations which must be made upto the end of the growing period. Each test shall include 120 plants for open field cultivation, which should be divided among 3 replications.

Separate plots for observation and for measuring can only be used if they have been subjected to similar environmental conditions.

4. Test plot design

Number of rows	:	5
Row length	:	6.4 m
Row to row distance	:	4.5 m
Plant to plant distance	:	0.80 m
Number of replications	:	3

- 5. Observations should not be recorded on plants in border rows.
- 6. Additional tests for special purpose may be established by the Authority.

#### IV. Methods and observations

- 1. The characteristics described in the table of characteristics (Section VII) should be used for the testing of varieties for DUS.
- 2. For the assessment of distinctiveness and stability, observations should be made on 30 plants or parts of plants selected randomly, which should be divided among 3 replications (10 plants in each replication).
- 3. For the assessment of uniformity of characteristics on the plot as a whole (visual assessment by a single observation of a group of plants or parts of plants), a population standard of 0.5% with an acceptance probability of at least 95% should be applied. In the case of a sample size of 120 plants, the number of off-types should not exceed 3.
- 4. For the assessment of colour characteristics, it is recommended that Royal Horticultural Society (RHS) colour chart be used.
- 5. Observation of leaf will be recorded on one leaf above the first fruit set nodes.
- Observations on the leaf blade should be made on a fully developed leaf blade, from the 15<sup>th</sup> node upwards to 20<sup>th</sup> node.
- 7. All observations on the flowers should be made on flowers between the 10th and the 20th node.
- 8. All observations on the seed should be made on fully developed and dry seed, after washing and drying in the shade.

- 9. All observations on the immature fruit should be made on fruits around 8-14 days after anthesis, between the 10th and 20th node.
- 10. Main vine length to be observed at the time of mature fruit stage.
- 11. The main skin colour of fruit is the colour with the largest area over the whole fruit excluding the scar area.
- 12. The fruit diameter should be observed at the broadest part.
- 13. Stage of recording of different observation will be as follows:

	Description	Code
a	Cotyledons completely unfolded	10
b	Active vegetative growth	20
с	50 % flowering stage (first pistillate flower appears in 50% plant)	30
d	Immature fruit harvest stage (first to third green fruit harvest)	40
e	Full fruit maturity stage (seed harvest maturity)	50

## V. Grouping of varieties

- The collection of varieties to be grown should be divided into groups to facilitate the assessment of distinctiveness. Characteristics, which are suitable for grouping purposes, are those, which are known from experience not to vary, or to vary only slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.
- 2. It is recommended that the competent authorities use the following characteristics for grouping varieties:

Fruit	:	Main color of skin at immature harvest stage (characteristic 14)
Fruit	:	Surface grooves (characteristic 18)
Fruit	:	Length (characteristic 20)
Fruit	:	Diameter (characteristic 21)
Fruit	:	Shape (characteristic 22)
	Fruit Fruit Fruit Fruit Fruit	Fruit:Fruit:Fruit:Fruit:Fruit:

#### VI. Characteristics and symbols

- 3. To assess distinctiveness, uniformity and stability, the characteristics and their states as given in the table of characteristics should be used.
- 4. Notes (1-9) should be used for the purposes of recording the data and electronic processing of data. Each state of expression is allotted a corresponding numerical note (1-9) for the different characteristics.
  - 5. Legend

- (\*) Characteristics that should be used in every growing season on all varieties and shall always be included in the description of the variety, except when the states of expression of any of these characters is rendered impossible by a preceding characteristic or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation shall be provided.
- (+) See explanations on the table of characteristics in section-VIII.
- 6. Type of assessment of characteristics indicated in column 7 of table of characteristics is as follows:
- MG : Measurement by a single observation of a group of plants or parts of plants
- MS : Measurement of a number of individual plants or parts of plants
- VG : Visual assessment by a single observation of a group of plants or parts of plants
- VS : Visual assessment by observations of individual plants or parts of plants

VII	Table of characte	erstics				
<b>S.</b>	Characteristics	States	Note	Example varieties	Stage of	Type of
No					observation	assessment
1	2	3	4	5	6	7
1.	Cotyledon:	Short	3	NarendraAgrim	10	MS
	length	(<4.5cm)	_	6		
	C	Medium	5	Arka Chandan,	-	
		(4.5-5.5cm)		Kashi Harit,		
				Narendra Amrit		
		Long	7	KPS-1,		
		(>5.5cm)		PusaVishwas		
2.	Cotyledon:	Narrow	3	ArkaChandan	10	MS
	width	(<2.5cm)				
		Medium	5	NarendraAgrim,		
		(2.5-3.5cm)		KashiHarit		
		Broad	7	NarendraAmrit,		
		(>3.5cm)		Sooraj		
3.	Plant: length of	Short	3	KashiHarit,	50	MS
(*)	main vine	(<3m)		NarendraAgrim	_	
		Medium (3-	5	Pusa Vikas,		
		4.5m)		Narendra Amrit,		
		-		Punjab Samrat	_	
		Long	7	CO-2, Arka		
4	DI	(>4.5m)	1	Chandan	20	NO
4.	Plant: stem	Angular	1	Kashi Harit, Arka	20	VG
	snape			Chandan, Pusa		
		Dound	2	VIKAS	-	
5	Laafbladar	Round Short	2	- VDDV 222 2 1	20	MS
5.	Leaf blade:	Short (<15cm)	3	VKPK-222-2-1	20	MS
	lengui	(<13cm) Madium	5	(genotype) Kashi Harit Arka	_	
		(15, 20  cm)	5	Chandan CO 2		
		(13-20011)		Narendra $\Delta grim$		
				Narendra Amrit		
				Puniab Samrat		
		Long	7	Sooraj.	1	
		(>20cm)		PusaVishwas		
6.	Leaf blade:	Narrow	3	VRPK-222-2-1	20	MS
	width	(<15cm)		(genotype)		
		Medium	5	Kashi Harit, Arka	1	
		(15-20cm)		Chandan, Narendra		
		· ·		Agrim, KPS-1		
		Broad	7	Narendra Amrit,		
		(>20cm)		Pusa Vishwas,		
				Sooraj		

$ \begin{array}{ c c c c } (+) & \margin & \mar$	7.	Leaf blade:	Entire or	1	PusaVikas	20	VG
weakly incisedweakly incisedweakly incisedSooraj, KashiHaritWeakly incised2Sooraj, KashiHaritModerately incised3ArkaChandan8. (*)Leaf blade: intensity of green colour of upper sideLight (137a)3PusaVikas(*)Dark (137b)7KashiHarit, Chandan, Punjab Samrat20VGDark (139a)7KashiHarit, NarendraAgrim, Sooraj20VG9.Leaf blade: silver patchesAbsent1PusaVikas Chandan, Narendra Agrim, Narendra Agrim, Pusa Vikas40MS10.Peduncle: (<10cm)	(+)	margin	very				
incisedincisedincisedWeakly incised2Sooraj, KashiHarit incisedModerately incised3ArkaChandan8. (*)Leaf blade: intensity of green colour of upper sideLight (137a)3PusaVikas20VGMedium (137b)5CO-2, Arka Chandan, Punjab SamratChandan, Punjab Samrat20VG9. silver patchesLeaf blade: matched in the silver patchesAbsent1PusaVikas Chandan, Narendra Agrim, Narendra Agrim, Narendra Agrim, Narendra Agrim, Narendra20VG10. Petiole: length lengthShort (<12em)		-	weakly				
Weakly incised2 Moderately incisedSooraj, KashiHarit incised8. (*)Leaf blade: intensity of green colour of upper sideLight (137a)3ArkaChandan8. (*)Leaf blade: intensity of green colour of upper sideLight (137b)3PusaVikas CO-2, Arka Chandan, Punjab Samrat20VG9. 10.Leaf blade: silver patchesAbsent1PusaVikas Sooraj20VG9. 10.Leaf blade: silver patchesAbsent1PusaVikas Amrit20VG10. 10.Petiole: length empthShort (<12cm)			incised				
incisedincisedincisedModerately incised3 ArkaChandanArkaChandan8.Leaf blade: intensity of green colour of upper sideLight3 (137a)PusaVikas20VG(*)Medium (137b)5 SamratCO-2, Arka Chandan, Punjab SamratCO-2, Arka Chandan, Punjab SamratVG9.Leaf blade: silver patchesAbsent1 PresentPusaVikas20VG9.Leaf blade: silver patchesAbsent1 PresentPusaVikas Chandan, Narendra Agrim, Narendra Agrim, PusaVikas,MS11.Peduncle: length (<10cm)			Weakly	2	Sooraj, KashiHarit		
Moderately incised3 ArkaChandanArkaChandan8. (*) intensity of green colour of upper sideLight (137a)3 PusaVikas20 VGVG9. silver patchesDark (137a)7 Dark (137a)KashiHarit, NarendraAgrim, Sooraj20 SamratVG9. silver patchesLeaf blade: silver patchesAbsent Present1 PusaVikasPusaVikas Chandan, Narendra Agrim, Narendra Agrim, Narendra Agrim, Narendra Agrim, Narendra Medium (<12cm)			incised		5,		
Image: second			Moderately	3	ArkaChandan		
8.   Leaf blade: intensity of green colour of upper side   Light (137a)   3   PusaVikas   20   VG     (*)   intensity of green colour of upper side   Medium (137b)   5   CO-2, Arka Chandan, Punjab Samrat   20   VG     Dark (137b)   7   KashiHarit, NarendraAgrim, Sooraj   20   VG     9.   Leaf blade: silver patches   Absent   1   PusaVikas   20   VG     10.   Petiole: length   Abort (<12cm)			incised				
	8.	Leaf blade:	Light	3	PusaVikas	20	VG
of green colour of upper sideMedium (137b)5 cCO-2, Arka Chandan, Punjab SamratDark (139a)7KashiHarit, NarendraAgrim, Sooraj20VG9.Leaf blade: silver patchesAbsent1PusaVikas Chandan, Narendra Agrim, Narendra Agrim, Narendra Amrit20VG10.Petiole: length Long (<12.18cm)	(*)	intensity	(137a)				
of upper side(137b)Chandan, Punjab SamratDark (139a)7KashiHarit, NarendraAgrim, Sooraj209.Leaf blade: silver patchesAbsent1PusaVikas Chandan, Narendra Agrim, Narendra Agrim, Narendra Amrit20VG10.Petiole: lengthShort (<12cm)		of green colour	Medium	5	CO-2, Arka		
Image: Normation of the sector of the sect		of upper side	(137b)		Chandan, Punjab		
Dark (139a)7KashiHarit, NarendraAgrim, Sooraj9.Leaf blade: silver patchesAbsent1PusaVikas20VG9.Leaf blade: silver patchesAbsent1PusaVikas20VG9.Leaf blade: silver patchesPresent9Kashi Harit, Arka Chandan, Narendra Agrim, Narendra Agrim, Narendra Amrit20VG10.Petiole: length (<12cm)		11	× ,		Samrat		
$ \begin{array}{ c c c c c } \hline & (139a) &$			Dark	7	KashiHarit.		
9.Leaf blade: silver patchesAbsent1PusaVikas Present20VG9.Leaf blade: silver patchesAbsent1PusaVikas20VG9.Kashi Harit, Arka Chandan, Narendra Agrim, Narendra AmritChandan, Narendra Agrim, Narendra Amrit20VG10.Petiole: length MediumShort (<12cm)			(139a)	-	NarendraAgrim.		
9.Leaf blade: silver patchesAbsent1PusaVikas Present20VG9Kashi Harit, Arka Chandan, Narendra Agrim, Narendra Agrim, Narendra Amrit20VG10.Petiole: lengthShort (<12cm)					Soorai		
Initial silver patchesPresent9Kashi Harit, Arka Chandan, Narendra Agrim, Narendra AmritInitial Agrim, Narendra Agrim, Narendra Agrim, Narendra Agrim, Narendra AmritInitial Agrim, Narendra Agrim, Narendra Agrim, Narendra Amrit10.Petiole: lengthShort (<12cm)	9.	Leaf blade:	Absent	1	PusaVikas	20	VG
InterpretendsFreedom<	2.	silver patches	Present	9	Kashi Harit, Arka		
Image: Second and the second and th		sint or provines	1 resent	-	Chandan Narendra		
10.Petiole: lengthShort (<12cm)3 Medium (<12-18cm)NarendraAmrit Punjab Samrat20MS10.Petiole: lengthShort (<12-18cm)					Agrim Narendra		
10.Petiole: lengthShort (<12cm)3 (<12cm)NarendraAmrit20MS10.Petiole: lengthShort (<12cm)					Amrit		
10.Performed a bind (<12cm)Supervised a bind (<12cm)Supe	10	Petiole: length	Short	3	NarendraAmrit	20	MS
(1200) $(1200)$ $(1200$	10.	i euole: lengui	(<12  cm)	5		20	1015
11.Peduncle: (12-18cm)7 (2-18cm)CO-2, Arka Chandan, Pusa Vikas11.Peduncle: (>10cm)Short3 PusaVishwasArkaChandan, PusaVishwas11.Peduncle: (<5cm)			Medium	5	Pusa Vikas, KPS-1		
Image SummeLong (>18cm)7 (>18cm)CO-2, Arka Chandan, Pusa Vikas11.Peduncle: lengthShort (<5cm)			(12-18  cm)	U	Puniab Samrat		
11.Peduncle: lengthShort3 (<18cm)			Long	7	CO-2 Arka	-	
Initial and the second of th			(>18cm)	,	Chandan Pusa		
11.Peduncle:Short3ArkaChandan, PusaVishwas40MSlength(<5cm)			(>10011)		Vikas		
Image: Section of the section of th	11.	Peduncle:	Short	3	ArkaChandan.	40	MS
Indigition   Indigition   Indigition   Indigition   Indigition   Indigition     Medium (5- 10cm)   5   Narendra Agrim, Pusa Vikas, Narendra Amrit   Pusa Vikas, Narendra Amrit     Long (>10cm)   7   Sooraj, PusaVikas   Indigition   Indigition     12.   Peduncle: diameter (point of attachment at immature stage)   Small (<1cm)		length	(<5cm)	C	PusaVishwas		1112
10cm)   Pusa Vikas, Pusa Vikas, Narendra Amrit     Long (>10cm)   7     Sooraj, PusaVikas     (>10cm)     12.   Peduncle: diameter (point of attachment at immature stage)   3     Medium (1- immature stage)   5     Pusa Vishwas, Kashi Harit, Arka   Medium (1- content of the stage)			Medium (5-	5	Narendra Agrim		
100ml)   100ml)   100ml)   100ml)     Narendra Amrit   Narendra Amrit     Long   7   Sooraj, PusaVikas     (>10cm)   7   Sooraj, PusaVikas     12.   Peduncle:   Small   3     diameter (point   (<1cm)			10 cm)	5	Pusa Vikas		
12.   Peduncle:   Small   3   NarendraAgrim   40   MS     of attachment at immature stage)   1.4cm)   5   Pusa Vishwas, Kashi Harit, Arka   6   6			Toemy		Narendra Amrit		
12. Peduncle: Small 3 NarendraAgrim 40 MS   of attachment at immature stage) 1.4cm) 5 Pusa Vishwas, Kashi Harit, Arka 40 MS			Long	7	Soorai PusaVikas		
12.   Peduncle:   Small   3   NarendraAgrim   40   MS     diameter (point of attachment at immature stage)   Medium (1- 1.4cm)   5   Pusa Vishwas, Kashi Harit, Arka   40   MS			(>10  cm)	,	500raj, 1 usa v ikas		
diameter (point diameter (point diameter (c1cm)) reachain (c1cm)   of attachment at immature stage) Medium (1- 5 1.4cm)	12	Peduncle	Small	3	NarendraAorim	40	MS
of attachment at immature stage) 1.4cm) Busa Vishwas, Charlet Arka	12.	diameter (point	(<1cm)	5			1116
immature stage) 1.4cm) Kashi Harit, Arka		of attachment at	Medium (1-	5	Pusa Vishwas	1	
		immature stage)	1.4 cm)	5	Kashi Harit Arka		
l l L L Chandan			1.10111/		Chandan		
$\frac{1}{1}$			Large	7	CO-2	1	
(>1.4  cm)			(>1.4  cm)	,			
13 Peduncle: Absent 1 - 40 VG	13	Peduncle	Absent	1	-	40	VG
nubescence (at Present 9 Soorai	13.	nubescence (at	Present	9	Soorai		
immature fruit		immature fruit	105011	,	PusaVishwas		
stage)		stage)			1 USU 1 ISII W US		

14.	Fruit: main	Cream	1	NarendraAmrit	40	VG
(*)	colour of skin	Light green	2	Arka Chandan,		
	(at immature	0 0		Pusa Vikas,		
	fruit stage)			Narendra Agrim		
		Medium	3	KashiHarit		
		green				
		Dark green	4	NarendraAgrim		
	Fruit: skin	Uniform	3	NarendraAgrim	40	VG
15.	colour pattern	Mottled	5	KashiHarit		
(*)	1	Striped	7	PusaVishwas		
		···· I ···				
	Fruit: shape at	Raised	1	PusaVishwas	50	VG
16.	peduncle end	Flat	2	Punjab Samrat		
(*)	•	Moderately	3	Narendra Agrim,		
(+)		Depressed		KPS-1, Kashi Harit,		
		1		Arka Chandan,		
				Narendra Amrit,		
				Sooraj, CO-2		
		Strongly	4	-		
		depressed				
17.	Fruit: shape at	Depressed	1	Narendra Amrit.	50	VG
(*)	blossom end	I		Kashi Harit. Arka		
(+)				Chandan, Sooraj		
` ´		Flat	2	-		
		Raised	3	PusaVishwas		
	Fruit: surface	Absent	1	-	50	VG
18.	grooves	Present	9	Narendra Amrit.		
(*)	0		-	CO-2. Soorai.		
~ /				Kashi Harit, KPS-1		
19.	Fruit: marbling	Absent	1	Narendra	50	VG
	(immature		-	Amrit.Narendra		
	stage)			Agrim,		
	0 /	Weak	3	PusaVishwas.		
			-	PusaVikas		
		Medium	5	KashiHarit, Punjab		
			U U	Samrat		
		Strong	7	-		
20.	Fruit: length	Short	3	NarendraAgrim	50	MS
(*)	(mature stage)	(<12cm)	÷		~~	
	(	Medium	5	Kashi Harit, Pusa	1	
		(12-20  cm)	-	Vikas, Soorai		
		Long (21-	7	PusaVishwas		
		30cm)	,			
		Very long	9	-	1	
		(>30cm)	-			

21.	Fruit: diameter	Small	3	ArkaChandan	50	MS
(*)	(mature stage)	(<15cm)				
		Medium	5	KashiHarit, Sooraj,		
		(15-30cm)		Pusa Vishwas,CO-2		
		Large	7	KPS-1,		
		(>30cm)		NarendraAmrit		
22.	Fruit: shape	Heart	1	CO-2	50	VG
(*)	_	shaped				
(+)		Round flat	2	NarendraAmrit		
		Oval or	3	PusaVishwas		
		oblong				
		Rectangular	4	-		
		Spherical	5	NarendraAgrim		
		Pear shaped	6	-		
		Club	7	-		
		shaped				
		Cylindrical	8	-		
23.	Fruit: main	Cream	1	NarendraAmrit,	50	VG
	colour of skin	(GYG-		CO-2		
	(mature stage)	161C)				
		Green with	2	Kashi Harit, Pusa		
		creamy		Vishwas		
		patches				
		(GYG-				
		162C)				
		Orange	3	ArkaChandan		
		(OG-24D)				
24.	Fruit: waxiness	Absent	1	-	50	VG
	of skin (at	Present	9	ArkaChandan, CO-		
	mature fruit			2, PusaVishwas		
	stage)					
25.	Fruit: main	Creamy	1	NarendraAmrit	50	VG
	colour of flesh	white (YG-				
		11D)				
		Yellowish	2	Pusa Vikas,Kashi		
		orange		Harit, Punjab		
		(YOG-13C)		Samrat		
		Greenish	3	Sooraj,CO-2		
		orange				
		(GYG-1C)				
		Orange	4	-		
		Dark	5	ArkaChandan,		
		orange		PusaVishwas		
		(YOG-17C)				
26.	Fruit: thickness	Thin	3	Sooraj, Kashi Harit	50	MS

(*)	of	(<2.5cm)				
	flesh	Medium	5	Narendra Agrim,		
		(2.5-4.5cm)		Sooraj, Pusa		
				Vishwas		
		Thick	7	Narendra		
		(>4.5cm)		Amrit,CO-2		
27.	Fruit: diameter	Small	3	NarendraAgrim	50	MS
	of	(<1cm)				
	scar (blossom	Medium (1-	5	Kashi Harit, KPS-1,		
	end)	2cm)		Pusa Vishwas		
		Large	7	ArkaChandan,		
		(>2cm)		Sooraj		
	Seed: length	Short	3	Arka Chandan,	50	MS
28.		(<1.2cm)		Narendra Agrim,		
				Sooraj		
		Medium	5	Kashi Harit, KPS-1,		
		(1.2-1.6cm)		Narendra Amrit,		
				Punjab Samrat		
		Long	7	CO-2, PusaVikas		
		(>1.6cm)				
29.	Seed: width	small	3	ArkaChandan	50	MS
		(<0.6cm)				
		medium	5	Sooraj, KashiHarit		
		(0.6-0.9cm)				
		large (>0.9	7	CO-2, PusaVishwas		
		cm)				
30.	Seed: colour of	cream	1	NarendraAgrim,	50	VG
	coat	(YW-158a,		CO-2, KashiHarit		
		OW-159b)				
		yellow	2	Pusa Vikas,		
		(GY-162c)		Narendra Amrit,		
				Sooraj		
		White	3	-		
		Brown	4	-		

# VIII. Explanation of table of characteristics Ch.7: Leaf blade: margin









Ch. 17: Fruit: shape of blossom end (flower scar included)



Depressed (1)

Flat (2)

Raised (3)



Ch. 22: Fruit: shape





Flat round (2)



Oval (3)



# IX. DUS test centres

Nodal Centre	Other Centre
Indian Institute of Vegetable Research, P.B.	5. Indian Institute of Horticultural Research,
No 01, P.OJakhini (Shahanshahpur),	Hessarghatta, Lake Post, Bengaluru-560089
Varanasi-221 305 (U.P.)	(Karnataka).
	6. Indian Agricultural Research Institute, Pusa, New
	Delhi-110012