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**ICAR-INDIAN INSTITUTE OF SPICES RESEARCH**  
(Indian Council of Agricultural Research)



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आई सी ए आर सर्वोत्तम संस्थान पुरस्कार (सरदार पटेल) विजेता - 1999 तथा 2009  
Sardar Patel Outstanding ICAR Institution Award Winner - 1999 & 2009

**Dr. Johnson George K**  
Principal Scientist

To whom It may concern

Based on the biochemical analysis done at ICAR-IISR, I hereby report on the quality characteristics of "ADI Pepper" provided by Mr. Poonacha N N.

Quality Characteristics of "ADI Pepper"

Oil (%)	4.8-5.2
Bulk density (g/L)	626-626.5
Oleoresin (%)	9.4-10.1
Piperine (%)	3.49-3.57

Essential oil profile of "ADI Pepper"

$\alpha$ - Thujene	2.12
$\alpha$ - Pinene	4.57
Camphene	0.14
Sabinene	11.28
$\beta$ -Pinene	4.97
Myrcene	2.23
$\alpha$ - Phellandrene	15.70
(+)-3-Carene	5.69
$\alpha$ - Terpinene	0.57
D-Limonene	21.16
$\beta$ -Z-Ocimene	1.17
$\gamma$ -terpinene	0.82
4-thujanol	0.14
Terpinolene	0.11
Linalool	0.41
P-menth-2-en-1-ol	-
L-4-terpineol	1.73
$\alpha$ - Terpineol	0.13
Trans-piperitol	0.02
Nerol	-
Piperitone	0.13
Thymol	-
$\delta$ -elemene	0.56
$\alpha$ - Cubebene	-
(+)-cyclosativene	-
Copaene	0.60

$\beta$ -elemene	0.58
$\beta$ -Caryophyllene	9.80
$\beta$ -cubebene	-
$\alpha$ - Guaiene	-
(+)- $\delta$ -cadinene	0.28
$\alpha$ - Caryophyllene	
Germacrene D	0.76
$\beta$ -Selinene	0.64
$\gamma$ -Elemene	1.33
$\alpha$ - Muurolene	
$\beta$ -Bisabolene	0.60
$\gamma$ -cadinene	
(+)-delta-cadinene	
$\alpha$ - Humulene	0.93
t- Nerolidol	0.09
Caryophyllene oxide	0.91
$\delta$ -cadinol	-
$\delta$ -cadinene	-

*Signature*  
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