IJPSR (2023), Volume 14, Issue 9 **(Research Article)**

INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES AND RESEARCH

Received on 01 February 2023; received in revised form, 09 May 2023; accepted 30 May 2023; published 01 September 2023

DEVELOPMENT AND EVALUATION OF ORAL DISINTEGRATING TABLETS OF SPRAY-DRIED ARIPIPRAZOLE SOLID DISPERSIONS

Preethi Sudheer * and S. V. Rajendra

Department of Pharmaceutics, Krupanidhi College of Pharmacy, Bangalore - 560035, Karnataka, India.

Keywords:

Aripiprazole, Solid dispersion, Spray drying, Mannitol, optimization

Correspondence to Author:
Dr. Preethi Sudheer

Professor,
Department of Pharmaceutics,
Krupanidhi College of Pharmacy,
Bangalore - 560035, Karnataka, India.

E-mail: preetisudheer@gmail.com

ABSTRACT: Aripiprazole is a biopharmaceutics classification system (BCS) II drug used to treat schizophrenia and bipolar disorders. A fast-dissolving tablet will be an appropriate drug delivery route in these conditions. Therefore, the objective of the work was to convert aripiprazole into a solid dispersion via a spray drying process and further present it as an oral fast-dissolving tablet for improving patient compliance. The solid dispersion of the drug in mannitol from solvent evaporation via spray-drying forms porous amorphous solid dispersions. The spray drying trials were optimized using a custom design approach via Design Expert software version 13. Oral fast-disintegrating tablets containing optimized solid dispersions were evaluated for tableting properties, *in-vitro* drug release profile, and pharmacokinetic profile compared to aripiprazole. The optimized solid dispersion exhibited a 2-fold increase in solubility compared to pure aripiprazole. The tablet disintegrated in 27.1± 1.1seconds. The *in-vitro* drug dissolution showed a four-fold increase in drug release profile compared to pure aripiprazole in one h. The pharmacokinetic profile observed a two-fold increase in the bioavailability of solid dispersion in comparison to the pure drug suspension. The stability studies for six months assured the stability of the tablet. In conclusion, an orally disintegrating tablet of aripiprazole with improved solubility may increase the therapeutic efficacy of the drug.

INTRODUCTION: The oral route is the most convincing route of drug administration. However, the oral route faces many challenges, such as the low therapeutic efficacy of the medication due to poor water solubility and permeability. The drugs belonging to BCS II and IV encounter solubility issues. Therefore, to prepare an appropriate dosage form, we require drug in soluble form, as the soluble fraction will be readily available for therapeutic efficacy [1]. Numerous pharmaceutical manipulations exist to combat the poor solubility of medications, such as micronisation, micelles, lipid-based systems, and solid dispersions [2].

QUICK RESPONSE CODE

DOI: 10.13040/IJPSR.0975-8232.14(9).4658-65

This article can be accessed online on www.ijpsr.com

DOI link: https://doi.org/10.13040/IJPSR.0975-8232.14(9).4658-65

Solid dispersions are an exciting method to enhance the water solubility of poorly water-soluble drugs. Properties such as particle size reduction to a molecular level, increased wettability, porosity, and the property to exist in amorphous form add on solid dispersions [3]. Solid dispersion is the dispersion of drugs in hydrophilic carriers. The methods to prepare solid dispersions include rapid melt cooling, rapid solvent evaporation, melt extrusion, spray drying etc. Spray drying involves drying atomized solution or suspension of drug -carrier in a stream of hot air to a finely divided powder.

API in spray-dried form increases the solubility by increasing surface area and porosity [4, 5]. Psychosis is a state of mind where an individual experiences things that no one else experiences, an impaired relationship with reality. Psychotic symptoms can be part of conditions such as schizophrenia, schizoaffective disorder, personality disorder, and

bipolar disorder [6]. Antipsychotic drugs tend to block dopamine D2 receptors in the dopaminergic pathways of the brain [7]. Second-generation antipsychotic drugs are serotonin-dopamine antagonists under the class of atypical antipsychotics. Aripiprazole is an atypical antipsychotic that acts as a partial agonist at the dopamine (D2) receptors and an antagonist to the serotonin (5-HT2A) receptors. It is a BCS Class II compound with poor solubility and undergoes considerable metabolism with a bioavailability of about 60% [8]. Oral disintegrating tablets (ODT) combine the advantage of liquid conventional tablet dosage forms with additional traditional benefits of both dosage forms [9]. Moreover, in psychosis, ODT can be a convenient dosage form from in administration point of view. Therefore, the work is emphasized on preparing nanosized solid dispersion-based oral disintegrating tablets of aripiprazole for effective treatment of the disease.

MATERIALS: Aripiprazole procured from Watson India ltd. Mannitol, Crosspoidone from SD fine chemicals ltd. Mumbai. All the other chemicals and reagents used were of analytical grade.

METHODOLOGY:

Saturation Solubility Studies: An excess quantity of aripiprazole was added to 10 ml of water and kept under shaking for 72 hours in a bath shaker. The samples were filtered, diluted suitably, and analyzed spectrophotometrically at 255nm [10].

Preparation of Solid Dispersion *via* Solvent Spray Drying Method: Aripiprazole was dissolved in an ethanolic mannitol solution. Based on preliminary studies, the drug: carrier ratio chosen was 1: 2 based on preliminary studies. The solutions were spray dried using (Lab ultima; Model number LU 222 advanced). The process is optimized via a custom design approach. The factors chosen were inlet temperature, spray rate, and atomization pressure, and the responses studied were solubility and dissolution rate **Table 1** [11].

TABLE 1: THE EXPERIMENTAL DESIGN

Sl. no.	Inlet temperature ^{o}C	Feed rate in ml/min	Atomization pressure (bar)
1.	177.5	35	1.65
2.	195	37.7742	1.3
3.	187.7	30.8	1.7
4.	175	20	1.7
5.	187.9	50	1.442
6.	183	20	1.3
7.	175	50	1.7
8.	185	35	1.5
9.	183.091	20	1.56148
10.	182.6	38.9	1.3
11.	175	50	1.3
12.	175	30.8	1.444
13.	175	30.8	1.444
14.	195	20	1.54
15.	187.7	30.8	1.7
16.	185	35	1.5
17.	187.9	50	1.442
18.	195	50	1.7

Evaluation of Solid Dispersions: Spray-dried formulations (1:2 (Drug: carrier) at various conditions were selected per the experimental design and evaluated for practical yield, drug content solubility, and dissolution rate.

Practical Yield: The practical yield and the percentage yield were calculated**.**

Drug Content Determination: Solid dispersions containing an equivalent amount of aripiprazole (10 mg) were weighed into a 10 ml volumetric flask and diluted using ethanol; 1 ml was diluted to 10 ml using PBS 6.8 and analyzed spectroscopically [12].

Solubility Studies of Solid Dispersion: The solubility of solid dispersions is carried out by dissolving 25mg of drug equivalent solid dispersions in 10 ml of phosphate buffer PBS pH a 6.8 and subjected to shaking for 72 hours in a

vortex shaker. After 72 hours, a filtrate volume of 1 ml was diluted to 10 ml in a volumetric flask, followed by a 0.5 ml to 10 ml dilution. The drug concentration was determined using a Shimadzu UV spectrometer at 255nm [12].

***In-vitro* Drug Release Study:** *In-vitro* drug release study for all solid dispersions was carried out using USP dissolution apparatus–II. The solid dispersions were introduced into the dissolution media, phosphate buffer solution pH 6.8 and stirred at 50 rpm. Samples were withdrawn at 5 15, 30, 45 and 60 minutes. The drug concentration in the samples was determined spectroscopically at 255 nm[13].

Selection of Optimum Formula from the Experimental Design: The optimum formula was selected based on experimental design evaluation based on maximum desirability, and the optimum formulation was prepared and evaluated further. The optimum formulation was converted to ODT **Table 2.**

DSC Studies: To confirm the thermal behaviour of a pure drug in the presence of excipients, a DSC analysis was carried out. Approximately 5mg of the sample and drug equivalent formulations were precisely weighed into non-hermetically sealed aluminium pans and crimped. The samples were heated from 0°C to 350^{o}C at a heating rate of 10^{o}C/min. During the measurement, nitrogen was continuously purged at a flow rate of 40ml/min, and DSC thermograms were recorded in Shimadzu DSC-60, Japan [14].

X RD Studies: XRD pattern of neat sample and the crystal was studied using X-ray diffractometer D8 Discover, Bruker Axs, Germany). The pattern is collected between 10 to 900 angles at a gap of 0.010 [15, 16].

TABLE 2: FORMULATION OF ODT

Sl. no.	Materials used	Quantity
1	Solid dispersion	20mg (5 mg drug equivalent)
2	Polyvinyl Pyrrolidine	40mg
3	Crosspovidone	12mg
4	Microcrystalline cellulose	320mg
5	Magnesium stearate	2mg

Precompression Parameters of the Blend:

Angle of Repose: The precisely weighed blend is taken in a funnel. The funnel height is adjusted to touch the funnel tip to the apex of the heap of the blend. The drug (Solid dispersions)-excipient blend can flow freely through the funnel onto the surface. The diameter/radius of the powder cone is measured, and angle of repose is calculated using the following equation [1].

$$\tan \Theta = h/r$$

Density Profiles of the Solid Dispersions: Apparent bulk density is determined after pouring a balanced quantity of blend into a graduated cylinder of bulk density apparatus. The sample was allowed to tap 100 times, and the tapped volume was noted. Various densities and flowability parameters were given by the formulas given below. The general formula gives a compressibility index [18].

Bulk Density = (Weight of powder) / (Volume of the powder)

Tapped Density = (Weight of powder) / (Tapped volume of the powder)

Compressibility index = (Tapped density - Bulk density) / (Tapped density) × 100

Hausner ratio = (Tapped density) / (Poured density) × 100

Evaluation of Oral Disintegrating Tablets:

Assay of Tablets: The assay of the tablets was studied by crushing ten tablets in a mortar and weighing 10 mg drug equivalent tablet triturate. The tablet triturate was further dissolved in ethanol and diluted suitably, and the absorbance was measured spectrophotometrically at 255 nm [19].

Weight Variation: The weight variation test is carried out to ensure uniformity in the weight of tablets in a batch. Weight variation is carried out by weighing 20 formulation tablets; the average is calculated; the individual weight is also determined. The percentage deviation is calculated [19].

Hardness: The crushing strength of the tablets was measured using a Monsanto hardness tester. Five tablets from the formulation batch were tested randomly, and the average reading was noted. The hardness is measured in kg/cm^2 [19].

Friability: Ten tablets were weighed, and weight was noted down. The pre-weighed tablets were subjected to 25 rpm for 4 min in a Roche friability

reweighed after the studies. The percentage of friability is calculated using the formula.

$$\% \text{ Friability} = (W_1 - W_2) / (W_2) \times 100$$

Where, W_1 is the initial weight and W_2 is the final weight after the studies [19].

Disintegration Test: The USP disintegration apparatus contains six glass tubes, "3 long, open at the top, and held against a ten-mesh screen at the bottom end of the basket rack assembly. After placing the tablet in the glass tube, the basket rack is poisoned in 1-litre distilled water at 37±2°C. Assisted by up and down movements, the time taken by the tablet to disintegrate is noted [19].

***In-vitro* Dissolution Test:** The formulation's *in-vitro* drug release study was carried out using the USP type II dissolution apparatus. The ODT formulation was introduced into the dissolution media, phosphate buffer solution (PBS) pH 6.8, stirred at 100 rpm, and maintained at 37 °C. Samples were withdrawn in 5, 15, 30, 45, 60 minutes intervals, diluted suitably using the same media. The drug concentration in the samples was determined via UV spectroscopic method [19].

Stability Studies: The stability studies of the optimized formula were carried out at two stability conditions such as 25°C± 5°C for 65%RH and 45°C± 5°C 75% for 3 m. After storage, the formulations were studied drug content and disintegration time [20].

Pharmacokinetic Studies: Male Wistar rats weighing 140–160 g (6 weeks) were maintained under environmentally controlled conditions of temperature (23°±1°C) and humidity (55 ± 5%) and with a 12h light/dark cycle, having free access to water and regular lab diet for five days. The animals were divided into two groups (n=6). The first group was administered oral suspension of aripiprazole (2.65mg/kg) in sodium carboxy methyl cellulose (0.1%w/v) suspension, and the second group was administered dispersion of solid dispersion (2.65mg/kg). The blood samples were collected at the intervals of 0.5 h, 1 h, 2 h, 3 h, 4 h, 7.5, 12 h 24 h 48 h and 96 h and tail vein puncture. Blood samples were collected in an Eppendorf tube containing an anticoagulant sodium citrate solution. After centrifugation at 3000 rpm for 30 minutes, the plasma samples were stored at -80°C. The drug concentration in the sample was analyzed by the HPLC method. The pharmacokinetic parameters such as Cmax, tmax, and area under the curve (AUC) were determined and compared using suitable PK software [21].

RESULTS AND DISCUSSION:

Saturation Solubility Studies: The saturation solubility of aripiprazole in water was found to be 0.0073 mg/ml.

Preparation of Solid Dispersion of Aripiprazole *via* Spray Method: The solid dispersions of aripiprazole were prepared via the spray drying method using mannitol. The spray drying trials were optimized via custom experimental design. The factors such as inlet temperature, spray rate and atomization pressure were studied on responses such as solubility and dissolution rate. The system generated 18 experimental trials.

The solubility ranged between 0.086±0.008mg/ml - 0.179±0.09 mg/ ml. In comparison to pure drug, there was a 10-17 fold increase in the solubility for all the formulation trials **Table 3**. The controlled and reduced particle size, the corresponding increase in surface area, and perhaps a change in the crystal lattice to a less orderly pattern and conversion to nanosuspension to a more porous structure. The dissolution rate was in the range of 83.12±0.91% - 88.76±0.90. Results suggested the increase in solubility might have resulted in a subsequent rise in the dissolution rate. However, we could not conclude a solubility-assisted drug dissolution. The results of experimental trials were substituted to the model to obtain the model fit. At a maximum desirability of 0.854, suggesting an optimum formula with a solubility of 0.064 mg/ ml and dissolution rate of 87.87% on experimentation 0.078 mg/ml and dissolution rate of 87.23± 1.22 % was observed. The X-ray pattern exhibited a distinct peak pattern, wherein the formulations and the intensity of the peaks were reduced, and a more random pattern was observed in **Fig. 1** and **2**. The results suggested reduced crystallinity of the drug when prepared as solid dispersions. This is evident that the spray dying in the presence of a hydrophilic carrier increased the effective surface area, which would have contributed to the increased dissolution rate.

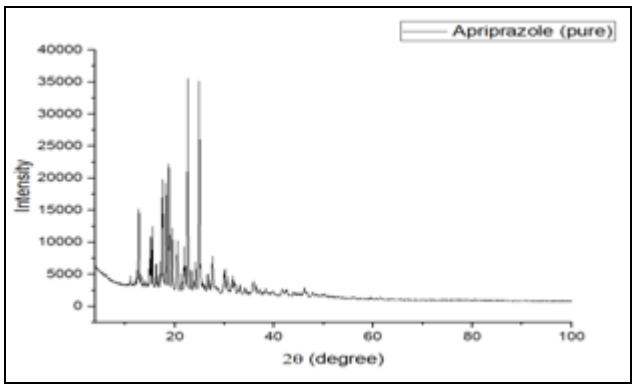

FIG. 1: X-RAY DIFFRACTION PATTERN OF PURE DRUG

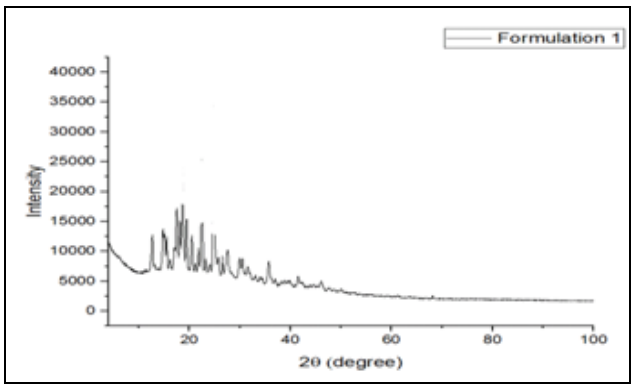

FIG. 2: X-RAY DIFFRACTION PATTERN OF SOLID DISPERSION

TABLE 3: EVALUTION OF SOLID DISPERSIONS

Sl. no.	Formulation code	Solubility in mg/ml	Dissolution rate in 30 min	Drug content (%)
1	S1	0.156±0.0.09	88.23± 1.23	98.98± 1.34
2	S2	0.159±0.08	85.12±0.998	99.19± 2.31
3	S3	0.148±0.10	85.16±1.02	98.45±2.12
4	S4	0.116±0.08	84.34±1.90	99.08±1.01
5	S5	0.074±0.008	88.76±0.90	96.78±0.98
6	S6	0.192±0.11	84.23±1.21	99.12±1.34
7	S7	0.087±0.016	87.12±1.11	98.12±0.98
8	S8	0.152±0.08	86.18±1.12	99.90±1.21
9	S9	0.179±0.09	83.16±0.98	98. 11±1.98
10	S10	0.132±0.06	83.12±0.91	99.12±1.12
11	S11	0.087±0.07	86.99±1.45	99.12±1.24
12	S12	0.089±0.005	84.67±1.76	99.16±1.11
13	S13	0.087±0.07	86.77±1.12	98.12±1.34
14	S14	0.178±0.04	82.12±1.90	99.98±1.67
15	S15	0.116±0.09	83.14±1.88	97.12±1.23
16	S16	0.144±0.06	84.123±1.02	98.78±1.34
17	S17	0.086±0.008	84.15±1.08	99.08±1.21
18	S18	0.089±0.006	86.66±1.12	96.78±3.45

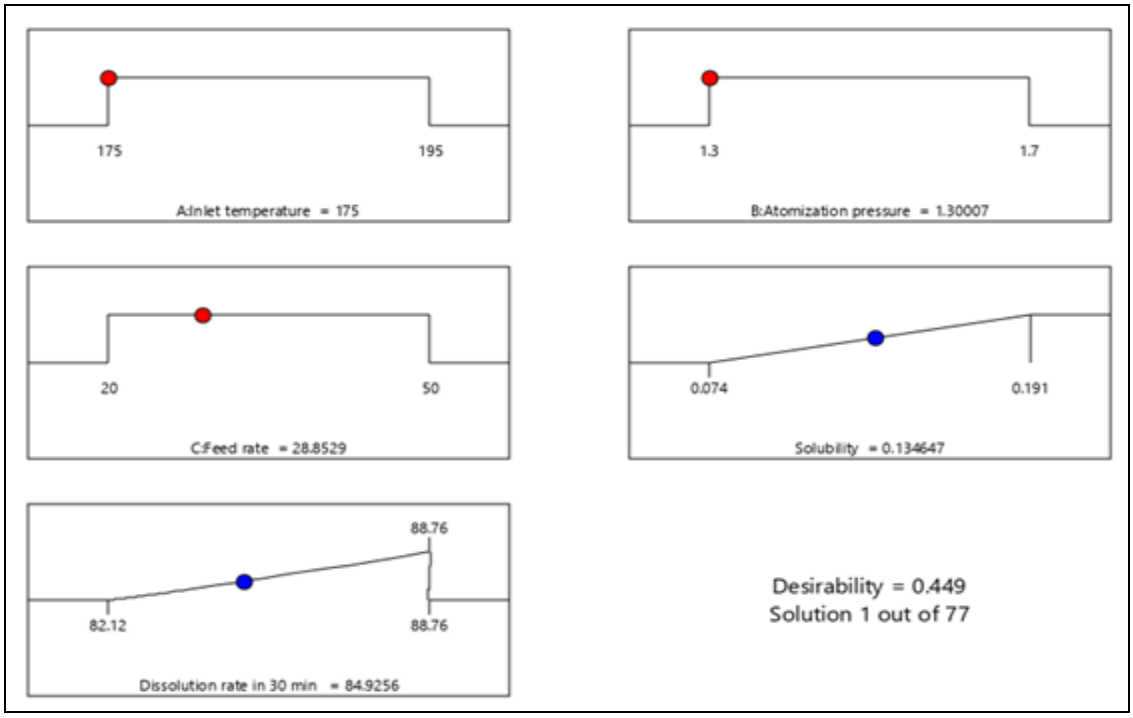

FIG. 3: NUMERICAL OPTIMIZATION FOR SELECTION OF OPTIMIZAIED FORMULA

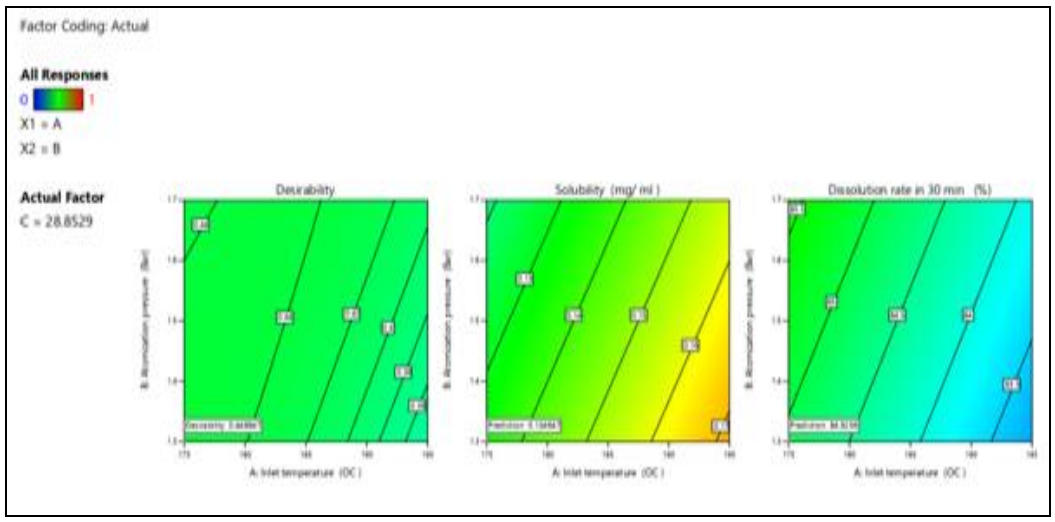

FIG. 4: CONTOUR PLOTS FOR RESPONSES SOLUBILITY AND DISSOLUTION RATE

TABLE 4: PRECOMPRESSION PARAMETERS OF THE TABLET BLEND

Sl. no.	Parameters	Results
1	Angle of Repose (^{o})	30.23
2	Bulk density (g/ml)	0.365
3	Tapped density (gm/ml)	0.452
4	Compressibility index (%)	10.25
5	Hausner ratio	0.11
6	Void volume (ml)	5
7	Porosity (%)	22

The Selection of Optimum Formula and Preparation of Oral Disintegrating Tablets: The optimum formula was converted to oral disintegrating tablets **Fig. 3** and **4**. The optimum formula was equivalent to 5 mg of blended microcrystalline cellulose, PVP, cross povidone, and magnesium stearate to obtain a compressible tablet blend. The tableting properties such as flowability, density profiles, and compressibility index were studied. The compressibility index of 10.25 assures good flowability, and the Hausner ratio assures flowability tableting property **Table 4.**

With promising tablet properties, the tablets were compressed, and various post-compression properties were studied. As given in the table, a compressibility index of 10 .25 and an angle of repose of 30.23 recommended good tableting properties, therefore, easily compressed to a tablet. The compressed tablets were studied for drug content, hardness, friability, and disintegration time. A hardness of about 3.23±0.5 Kg indicates reasonably good tableting properties. The comparatively low hardness might have been the reason for the friability of the higher side. The disintegration time of tablets was found to be 27.1± 1.1 **Table 5.** The optimum formulation exhibited a drug content of 97.51±1.02%. The disintegration time was found to be 27.1±1.1 sec. The solubilizing effect of solid dispersion and additive effect of cross povidone super disintegrant resulted from faster disintegration.

TABLE 5: EVALUATION OF ODT

S. no.	Parameters	Results
1	Drug content (%)	97.51± 1.02%
2	Hardness (Kg/Cm^2)	3.23±0.5
3	Friability (%)	0.999±0.2
4	Disintegratingtime (S)	27.1± 1.1

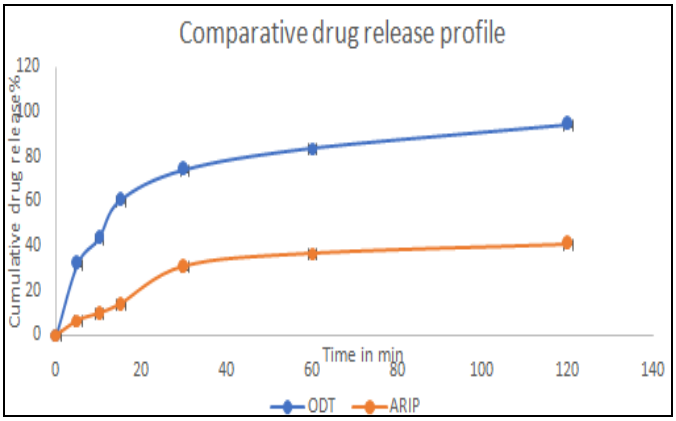

FIG. 5: COMPARATIVE DRUG RELEASE PROFILE OF ODT AGAINST ARIP (MARKETED FORMULATION)

The comparative dissolution profile indicates a four-fold increase in drug dissolution compared to the marketed tablet Arip 5mg. **Fig. 5** The increased solubility contribution from spray-dried powder, due to the maximum effective surface area contribution from the spray-dried powder, helps dissolve the drug.

Stability Testing: The stability studies at two different temperatures show no appreciable change in the physical appearance. There were no apparent changes observed in drug content. However, the disintegration time slightly increased after three months of storage. The results recommend room conditions for storage of the formulation.

Pharmacokinetic Evaluation of the Data: The pharmacokinetic studies after oral administration of prepared solid dispersion against the pure drug suspension indicated a remarkable change AUC parameter. The $AUC_{zero - inf}$ of the pure drug was found to be 89.07µg/mlh at a dose level of 0.5 mg/kg, whereas the formulation exhibited a bioavailability of 94.07 µg/ml h at half the dose level. The results suggest an increased solubility-assisted dissolution profile and the corresponding increase in the plasma concentration of the drug. The t_{max} of 5h suggests the rate of absorption; however, no changes were observed in comparison to pure drug. C_{max} of the solid dispersion observed a one-fold increase. The results suggest solid dispersion via spray drying can potentially improve the therapeutic efficacy **Fig. 6.**

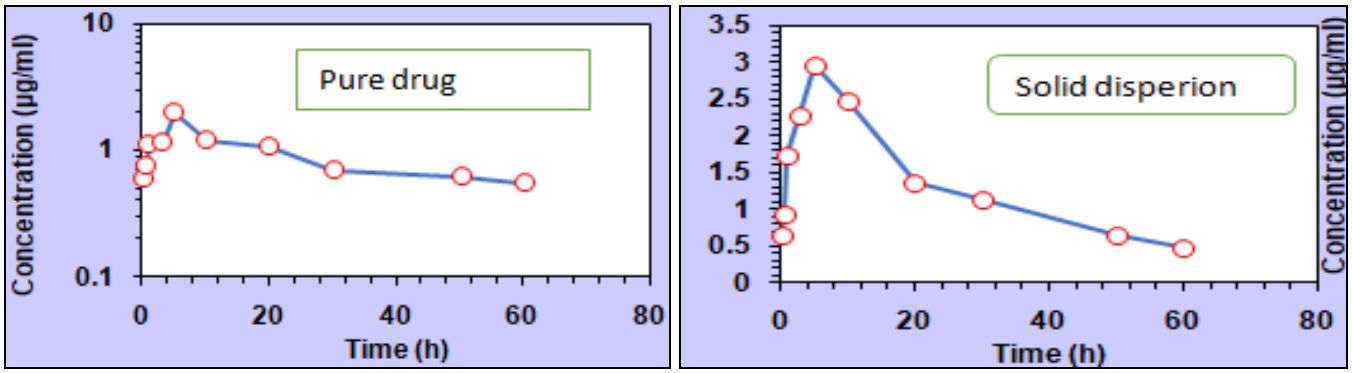

FIG. 6: COMPARATIVE PLASMA CONCENTRATION-TIME PROFILE OF SOLID DISPERSION AGAINST PURE DRUG

CONCLUSION: The solid dispersion of aripiprazole was successfully achieved via the spray drying method. The optimized formulation was converted to oral disintegrating tablets. The pharmacokinetic profile of the optimized solid dispersion compared to pure drug indicated a higher solubility of the formulation, therefore, a larger AUC. The short disintegration time ODT suggested the same could be an alternative to conventional oral therapy *via* an economical approach; the therapeutic efficacy of the aripiprazole may be improved.

ACKNOWLEDLMENTS: We acknowledge RGUHS, Bangalore, for the research grant. The authors thank the principal and management of Krupanidhi College of Pharmacy for the facilities provided for carrying out the research work.

CONFLICTS OF INTEREST: The authors declare no conflict of interest

REFERENCES:

1. Palpandi P, Raviteja B, Nagavendra K, Wahid K and Mandip S: Amorphous solid dispersions: An update for preparation, characterization, mechanism on bioavailability, stability, regulatory considerations, and marketed products. Int J of Pharm 2020; 586, https://doi.org/10.1016/j.ijpharm.2020.119560.
2. Pi J, Wang S, Li W, Kebebe D, Zhang Y, Zhang B, Qi D, Guo P, Li N and Liu Z: A nano-cocrystal strategy to improve the dissolution rate and oral bioavailability of baicalein. Asian J Pharm Sci 2019; 14(2): 154-164. doi: 10.1016/j.ajps.2018.04.009.
3. Alwossabi AM, Elamin ES, Ahmed EMM and Abdelrahman M: Solubility enhancement of some poorly soluble drugs by solid dispersion using Ziziphus spina-christi gum polymer. Saudi Pharm J 2022; 30(6): 711-725. doi: 10.1016/j.jsps.2022.04.002.
4. Surti N, Mahajan AN, Patel D, Patel A and Surti Z: Spray dried solid dispersion of repaglinide using hypromellose acetate succinate: *in-vitro* and *in-vivo* characterization. Drug Dev Ind Pharm 2020; 46(10): 1622-1631. doi: 10.1080/03639045.2020.1
5. Da Silva FLO, Marques MBF, Kato KC and Carneiro G: Nanonization techniques to overcome poor water-solubility with drugs. Expert Opin Drug Discov 2020; 15(7): 853-864. doi: 10.1080/17460441.2020.1750591
6. Alshehri S, Imam SS, Altamimi MA, Hussain A, Shakeel F, Elzayat E, Mohsin K, Ibrahim M and Alanazi F: Enhanced Dissolution of Luteolin by Solid Dispersion Prepared by Different Methods: Physicochemical Characterization and Antioxidant Activity. ACS Omega 2020; 5(12): 6461-6471. doi: 10.1021/acsomega.9b04075.
7. Rogóż Z, Wąsik A and Lorenc-Koci E: Combined treatment with aripiprazole and antidepressants reversed some MK-801-induced schizophrenia-like symptoms in

mice. Pharmacol Rep 2018; 70(4): 623-630. doi: 10.1016/j.pharep.2018.02.022.
8. Rapinesi C, Kotzalidis GD, Mazzarini L, Brugnoli R, Ferracuti S and De Filippis S: Long-Acting Injectable (LAI) Aripiprazole Formulations in the Treatment of Schizophrenia and Bipolar Disorder: a Systematic Review. Clin Drug Investig 2019; 39(8): 713-735. doi: 10.1007/s40261-019-00801-9.
9. Calabrese JR, Sanchez R, Jin N, Amatniek J, Cox K, Johnson B, Perry P, Hertel P, Such P, McQuade RD, Nyilas M and Carson WH: Symptoms and functioning with aripiprazole once-monthly injection as maintenance treatment for bipolar I disorder. J Affect Disord 2018; 227: 649-656. doi: 10.1016/j.jad.2017.10.035.
10. Giri BR, Kim JS, Park JH, Jin SG, Kim KS, Din FU, Choi HG and Kim DW: Improved Bioavailability and High Photostability of Methotrexate by Spray-Dried Surface-Attached Solid Dispersion with an Aqueous Medium. Pharmaceutics 2021; 13(1): 111. doi: 10.3390/pharmaceutics13010111.
11. Al-Zoubi N, GharaibehS, Aljaberi, A and Nikolakakis I: Spray drying for direct compression of pharmaceuticals. Processes 2021; 9: 267. https://doi.org/10.3390/ pr9020267
12. Mustafa WW, Fletcher J, Khoder M and Alany RG: Solid dispersions of gefitinib prepared by spray drying with improved mucoadhesive and drug dissolution properties. AAPS Pharm Sci Tech 2022; 23(1): 48. doi: 10.1208/s12249-021-02187-4.
13. Wang B, Wang X, Zhu Y, Yin T, Gou J and Wang Y: Characterization of nimodipine amorphous nanopowder prepared by quenching cooling combined with wet milling and spray drying. Int J Pharm 2022; 628: 122332. doi: 10.1016/j.ijpharm.2022.122332.
14. Angélica GC, José SL, Arkellau KS, Ilmara CP, Francisco VM and Bernardo MN: Pharmaceutical development of tablets containing a spray-dried optimized extract from Lippiaoriganoides H. B. K.: influence of excipients and toxicological assessment. Brazilian J Pharm Sc 2018; 54: 2. https://doi.org/10.1590/s2175-97902018000217226.
15. Lim LM, Tran TT, Long Wong JJ, Wang D, Cheow WS and Hadinoto K: Amorphous ternary nanoparticle complex of curcumin-chitosan-hypromellose exhibiting built-in solubility enhancement and physical stability of curcumin. Colloids Surf B Biointerfaces 2018; 167: 483-491. doi: 10.1016/j.colsurfb.2018.04.049.
16. Almansour K, Ali R, AlheibshyF,Almutairi TJ, Alshammari, RF, Alhajj N: Hydroethanolic versus Aqueous solutions. Pharmaceutics 2022; 14:800.https://doi.org/10.3390/pharmaceutics14040800
17. Fan N, He Z, Ma P, Wang X, Li C, Sun J, Sun Y and Li J: Impact of HPMC on inhibiting crystallization and improving permeability of curcumin amorphous solid dispersions. Carbohydr Polym 2018; 181: 543-550. https://doi: 10.1016/j.carbpol.2017.12.004.
18. Malamatari M, Charisi A, Malamataris S, Kachrimanis K and Nikolakakis I: Spray Drying for the preparation of nanoparticle-based drug formulations as dry powders for inhalation. Processes 2020; 8: 788. https://doi.org/10.3390/pr8070788.
19. Melziga S, Niedbalkaa D, Schildea C and Kwadea A: Spray drying of amorphous ibuprofen nanoparticles to produce granules with enhanced drug release. Colloids Surf A 2018; 536: 133–141.http://dx.doi.org/10.1016/j.colsurfa.2017.07.028.
20. Sakure K, Kumari L and Badwaik HR: Development and evaluation of solid dispersion based rapid disintegrating tablets of poorly water-soluble anti-diabetic drug. Development and evaluation of solid dispersion based rapid disintegrating tablets of poorly water-soluble anti-diabetic drug.J Drug Deliv Sci and Tech 2020; 60: 101942.https://doi.org/10.1016/j.jddst.2020.101942.
21. Muqtader Ahmed M, Fatima F, Abul Kalam M, Alshamsan A and Soliman GA: Development of spray-dried amorphous solid dispersions of tadalafil using glycyrrhizin for enhanced dissolution and aphrodisiac activity in male rats. Saudi Pharm J 2020; 28(12): 1817-1826. doi: 10.1016/j.jsps.2020.11.007.

How to cite this article:
Sudheer P and Rajendra SV: Development and evaluation of oral disintegrating tablets of spray dried aripiprazole solid dispersions. Int J Pharm Sci & Res 2023; 14(9): 4658-65. doi: 10.13040/IJPSR.0975-8232.14(9).4658-65.